JAN ORIGINAL RESEARCH

Work-home interference among nurses: reciprocal relationships with job demands and health

Beatrice I.J.M. van der Heijden, Evangelia Demerouti, Arnold B. Bakker & The NEXT Study Group coordinated by Hans-Martin Hasselhorn

Accepted for publication 29 January 2008

Correspondence to B.I.J.M. van der Heijden:
e-mail: heijden@msm.nl

Beatrice I.J.M. van der Heijden PhD
Professor of Strategic HRM
Maastricht School of Management, Open University of The Netherlands, Heerlen; University of Twente, Enschede, The Netherlands

Evangelia Demerouti PhD
Associate Professor
Department of Social and Organizational Psychology, Utrecht University, Utrecht, The Netherlands

Arnold B. Bakker PhD
Professor of Industrial and Organizational Psychology
Department of Work and Organizational Psychology, Erasmus University Rotterdam, Rotterdam, The Netherlands

Hans-Martin Hasselhorn PhD on behalf of the NEXT Study Group
Study Coordinator
University of Wüppertal,
Wüppertal,
Germany

VAN DER HEIJDEN B.I.J.M., DEMEROUTI E., BAKKER A.B. & THE NEXT STUDY GROUP COORDINATED BY HANS-MARTIN HASSELHORN (2008) Work-home interference among nurses: reciprocal relationships with job demands and health. *Journal of Advanced Nursing* **62**(5), 572–584
doi: 10.1111/j.1365-2648.2008.04630.x

Abstract

Title. Work-home interference among nurses: reciprocal relationships with job demands and health.

Aims. This paper is a report of a study with three aims: (i) to investigate whether emotional, quantitative and physical demands have a causal, negative impact on nurses' health; (ii) to examine whether work-home interference can explain this effect, by playing a mediating role; and (iii) to test the so-called *loss spiral* hypothesis claiming that nurses' health problems lead to even higher job demands and more work-home interference over time.

Background. While many scholars have thought in terms of the stressor → work-home interference → strain model, the validity of a model that includes opposite pathways needs to be tested.

Method. A questionnaire was completed twice, with a 1-year time interval by 753 (63·4%) Registered Nurses working in hospitals, 183 (15·4%) working in nursing homes, and 251 (21·1%) working in home care institutions. The first measurement took place between October 2002 and June 2003.

Findings. Our findings strongly support the idea of cross-lagged, reciprocal relationships between job demands and general health over time. The reciprocal model with work-home interference as an intervening variable (including reciprocal relationships between job demands, work-home interference and general health) showed a good fit to the data, and proved to be superior to both the *causality* and *reversed causation* models.

Conclusion. The higher nurses' job demands, the higher is their level of work-home interference and the more likely is a general health deterioration over time, in turn giving rise to higher job demands and work-home interference, which may even aggravate the nurses' general health, and so on.

Keywords: health, job demands, nurses, stress, work-home interference

Introduction

Nursing is associated with high levels of emotional, cognitive and physical strain (Bakker *et al.* 2000, Aiken *et al.* 2001, Le Blanc *et al.* 2001, Janiszewski Goodin 2003) and is, accordingly, characterized by a high risk for ill health (Cheng *et al.* 2000). There are numerous emergency situations where nurses have to act quickly, often alone, exerting extreme effort under extreme stress (Erlen & Sereika 1997, Reis Miranda *et al.* 1998). In addition, they have to respond to a variety of psychological issues presented by patients and their families (see, for example, Russell 1999), and many are even confronted with violence at their workplace (Rippon 2000, Duxbury & Whittington 2005).

Nurses are called on to provide 'life-saving' treatment, as well as information, reassurance and emotional support (Le Blanc *et al.* 2001). The frequency and intensity of these highly demanding workplace interactions may put a considerable emotional burden on them (De Rijk *et al.* 1998, Bourbonnais *et al.* 1999). Moreover, nursing often involves working in awkward positions, prolonged standing and lifting loads (e.g. Estryn-Béhar *et al.* 1990, Bakker *et al.* 2003).

In the longitudinal study reported here, we examined both causal and reversed causal relationships of work-home interference (WHI) with job demands and health. Despite the substantial increase in literature on (negative) WHI, there is lack of research into the way negative WHI is embedded in the stressor–strain relationship (see also Peeters *et al.* 2004).

Background

Work-home interference

On the basis of the role stress theory (Kahn *et al.* 1964), Greenhaus and Beutell (1985) provided the most widely used definition of interference or conflict between work and family roles. Accordingly, work-family interference is 'a form of inter-role conflict in which the role pressures from the work and family domains are mutually incompatible in some respect. That is, participation in the work (family) role is made more difficult by virtue of participation in the family (work) role' (p. 77). Greenhaus and Beutell suggested that the type of work-family conflict could be based on roles that affect time involvement, strain or behaviour in one domain (e.g. work), and that are incompatible with fulfilling roles in the other domain (e.g. family). Time-based work-family conflict arises if the amount of time spent in one domain (e.g. work) hampers meeting the requirements of the other domain (e.g. family). A strain-based conflict exists when it is difficult to fulfil the requirements in one role due to stressors in the other role, for example, tiredness at work as a consequence of lack of sleep because of child care responsibilities at home. The third form of conflict pertains to behavioural difficulties in switching between different roles.

Take, for example, a nurse who is confronted with a high workload and emotionally demanding interactions with patients. Frequent or intense exposure to these demands may result in strain and chronic stress that cannot easily be 'turned off' once the nurse goes home. The consequence may be that the nurse has sleepless nights, and does not recover adequately from the demands faced during the workday, which may eventually lead to a state of breakdown or ill health. In the present study, we specifically focused on the *negative* impact of the work domain on the home domain (from now on referred to as WHI), when participation at home and recovery are inhibited by virtue of the demands, experiences, and behaviours built up or faced at work. Although it has been recognized that WHI can also contribute to employee growth and better functioning in other life domains (Grzywacz & Marks 2000), our aim was to gain better understanding of its possible negative consequences.

Job demands cause WHI and ill health

The idea that stressors cause WHI, and consequently strain, is a classical hypothesis in the occupational health psychology literature. This hypothesis is grounded in the effort-recovery (E-R) model (Meijman & Mulder 1998). Accordingly, the quantity and quality of *recovery* play a crucial role in the stressor–strain process. When, during a certain amount of time, little or no appeal is made to the psychobiological systems that were used for task performance, these systems will stabilize and employees will recover from the load effects that have built up during task performance. Although daily work usually involves loads that are not necessarily harmful, they recur day after day and may consequently function as a permanent source of tension. If opportunities for recovery after being exposed to a high workload are *in*sufficient – which is usually the case when employees experience WHI – the psychobiological systems are activated again before they even had a chance to stabilize.

The individual, still in a suboptimal state, will have to make additional (compensatory) effort (Hockey 1997). This may result in an increased intensity of the load reactions, which in turn will put higher demands on the recovery process. Thus, a cumulative process may yield a draining of energy and a state of breakdown or exhaustion (e.g. Sluiter 1999, Demerouti *et al.* 2004).

We located seven *longitudinal* studies that tested (parts of) the stressor → WHI → strain model. Leiter and Durup (1996) used a cross-lagged panel design with a 3-month time interval, and found that WHI had a longitudinal influence on emotional exhaustion and marital satisfaction. Frone *et al.* (1997) used a 4-year panel study to investigate the relationship of WHI with health-related outcomes among a random community sample of employed parents. WHI was longitudinally related only to elevated levels of alcohol consumption, and *unrelated* to elevated levels of depression, poor physical health, and the incidence of hypertension. Kelloway *et al.* (1999), in their 6-month interval longitudinal survey, reported that strain-based WHI emerged as an outcome of stress, while strain-based home-work interference was a precursor of both stress and turnover intentions.

Grant-Vallone and Donaldson (2001) used a 6-month follow-up study to examine the relationship between WHI and general well-being among a heterogeneous sample of employees. Their findings showed that Time 1 (T1) WHI was a predictor of Time 2 (T2) general well-being, after controlling for social desirability. Demerouti *et al.* (2004) used a three-wave panel study with a 6-week time interval, and found that work pressure predicted WHI, and that WHI, in turn, predicted exhaustion. Peeters *et al.* (2004), in their 1-year follow-up investigation, found evidence for predominant time-lagged paths from T1 cognitive, emotional and physical stressors to T2 WHI. In addition, they showed that WHI played a partial mediating role between all three types of job stressors on the one hand and exhaustion on the other.

Kinnunen *et al.* (2004), in their study on gender differences in WHI, found that, among women, WHI perceived at T1 statistically significantly predicted job dissatisfaction, parental distress as well as psychological symptoms at Time 2 (1 year later). However, among men, a low level of satisfaction or well-being at T1 (marital dissatisfaction, parental distress, psychological and physical symptoms) functioned as a precursor of WHI perceived at T2. In addition, the experience of WHI turned out to be relatively stable for both genders over the time period of 1 year. Finally, Van Hooff *et al.* (2006) who studied WHI by using both a general questionnaire addressing global WHI, and a 5-day daily diary study, found that global WHI was positively related to daily WHI, to the time spent daily on overtime work in the evening, daily fatigue and sleep complaints.

While several longitudinal approaches have addressed (parts of) the stressor → WHI → strain model, to the best of our knowledge, none of them has dealt with the impact of WHI upon *general health*. To partly close this gap, we tested reciprocal relationships of WHI with job demands and general health.

Ill health causes job demands and WHI

Although many scholars seem to think in terms of the stressor → WHI → strain model, there are several reasons to expect that a model with opposite pathways may be valid as well (Demerouti *et al.* 2004, see also, De Lange *et al.* 2005). Firstly, according to the '*drift*' *hypothesis* (Kohn & Schooler 1982, Zapf *et al.* 1996), individuals with bad health drift to worse jobs, which also go along with higher job stressors. Employees with high exhaustion or with problems managing work-home boundaries might be more often absent and therefore eventually get jobs that are accompanied with higher job demands and lower job resources.

Second, those employees who experience exhaustion or WHI will more likely stay behind their workflow, creating consequently more job demands (including work pressure). Third, job stressors may also be affected by employees' perceptions of these stressors (Zapf *et al.* 1996). Just like the tendency of depressed people to assess their environment more negatively, thus contributing to a more negative climate (Beck 1972), exhausted employees or employees with elevated levels of WHI may perceive a relatively high work pressure, and may complain more often about their workload. Therefore they are in fact creating an even more negative work climate.

In their review of longitudinal studies on organizational stress, Zapf *et al.* (1996) located six out of 16 studies that tested and provided evidence for reversed causation. Reversed causation has, for example, been found between social support and mental health (Schwarzer *et al.* 1993), job characteristics (like job complexity, job pressure and boundary spanning) and (dis)satisfaction (James & Tetrick 1986), and, more recently, between job demands (a composite measure including time pressure, working hard and job complexity) and emotional exhaustion (De Jonge *et al.* 2001).

In addition, three other longitudinal studies on WHI also provide evidence for parts of a reversed causation model. The first was a 6-month follow-up approach by Kelloway *et al.* (1999) among employees of a healthcare and a retail grocery organization. The researchers found that WHI was an *outcome* of strain (which they call 'stress', i.e. feelings of being overwhelmed by things and unable to cope, having troubles with concentrating). The second study was the cross-lagged panel study by Leiter and Durup (1996), which showed that WHI had *reciprocal* longitudinal relationships with emotional exhaustion and marital satisfaction. Moreover, among other findings, WHI appeared to predict work overload (increasing job demands) over time. However, in their 1-year follow-up study among Dutch police officers, Van Hooff *et al.* (2005) found that the normal causal model, in which strain-based (but not time-based) WHI was

longitudinally related to increased health complaints, fit the data statistically significantly better than the reversed causal model. It was concluded that (strain-based) WHI acts as a precursor of health impairment and that different patterns of (strain-based) WHI across time are related to different health courses. According to Van Hooff *et al.*, particularly the long-term experience of (strain-based) WHI may lead to an accumulation of health complaints.

Loss spirals

The general hypothesis that is tested in this study comes close to what Hobfoll (1989, 2001) calls 'loss spirals'. According to his 'conservation of resources' theory, individuals strive to obtain things they value. These are called 'resources' and include objects, conditions, personal characteristics and energies. People strive to protect themselves from resource loss, which makes loss more salient than gain. However, resources are related to each other in a 'web like' nature, which further suggests that resource loss and gain will occur in spirals. Loss spirals will follow initial losses, with each loss resulting in depletion of resources for confronting the next threat or loss (Hobfoll & Freedy 1993, p. 122). Besides, resource loss also prevents the switching of the situation into gain cycles. Applied to our study, this specific loss spiral looks as follows: job demands will evoke WHI and consequently diminish general health. Diminished general health will, in turn, give rise to higher job demands and WHI, etceteras.

The study

Aims

The study had three aims: (i) to investigate whether emotional, quantitative and physical demands have a causal, negative impact on nurses' health; (ii) to examine whether WHI can explain this effect, by playing a mediating role; and (iii) to test the so-called *loss spiral* hypothesis claiming that nurses' health problems lead to even higher job demands and more WHI over time.

We tested the following hypotheses:

Hypothesis 1: Job demands have lagged effects on WHI (positive) and general health (negative). Additionally, WHI has a lagged negative effect on health. In other words, WHI partially mediates the relationship between job demands and health.

Hypothesis 2: General Health has a lagged negative effect on WHI. Additionally, general health and WHI will have lagged effects on job demands (negative for general health, and positive for WHI respectively).

Design

This study was part of a large longitudinal European study on nurses' intention to leave the profession (NEXT, Nurses Early Exit, Hasselhorn *et al.* 2003).

Participants

The NEXT study team recruited healthcare institutions for the investigation and aimed for a reflection of national distribution of nurses working in different types of institutions, and across different geographical regions. Usually, the agreement of the employer and of employee representatives had to be gained. In each institution, a 'field manager' was identified who organized the assessments locally and who kept in close contact with the national NEXT team throughout the conduct of the study. Direct posting from the national NEXT team to the nurses' home address was preferred. This was possible after agreement of all parties involved. In some instances, the institutions put on the address label to avoid giving out addresses. In other cases the questionnaires were sent to the participants via the institution's internal mail.

Data collection

The baseline survey was carried out anonymously between October 2002 and June 2003, while the follow-up measurement took place 1 year later. Only those who had returned the first questionnaire received the second one. The latter implies that the follow-up sample comprises a subset of the baseline sample. To enhance generalizability, respondents were sampled across three different kinds of healthcare institutions hospitals ($N = 9$), nursing homes ($N = 9$) and home care institutions ($N = 4$). At T1, 9200 nurses received the questionnaire, and the mean response rate across institutions was 43·6% (or 4018 persons). Of the 4018 employees who received the questionnaire at T2, 1187 respondents returned it completed with a mean response rate of 29·5%.

The final Dutch sample consisted of 753 (63·4%) Registered Nurses working in hospitals, 183 (15·4%) working in nursing homes and 251 (21·1%) working in home care institutions. Participants' mean age was 39·8 years (SD = 9·7). The average number of years of nursing experience was 13·6 years (SD = 8·6), and mean organizational tenure was 4·3 years (SD = 1·0). Most nurses (94·4%) were female. Furthermore, 541 (53·4%) had children to take care of at home, with 299 (25·2%) taking care of children under the age of seven.

Measures

The NEXT Study Group attempted to take advantage of existing validated scales covering relevant aspects of the NEXT research model (Hasselhorn *et al.* 2003). The translation-back-translation method was used for each participating country (Hambleton 1994), i.e. the measurement scales were translated from one language to another and then back-translated to the original language by an independent translator. The purpose of this double translation was to allow experts to examine both versions of each questionnaire item to establish conformity of meaning. Where inconsistencies were found, the items were reformulated or, if necessary, eliminated.

The scales were pretested in up to six pretests in three countries. In some cases, scales had been specifically tailored to the nursing or healthcare professions (e.g. emotional demands by De Jonge *et al.* (1999). Otherwise, generic scales were used. The outcomes of the pretests enable us to conclude that the questionnaire that developed in the framework of the NEXT study corresponds to our requirements for a reliable and valid instrument. Moreover, the instrument appears to be user-friendly and easy to administer. All language and linguistic problems that might lead to difficulties in responding have been carefully assessed and, if necessary, translated into recommendations for refinement. The acceptability of the survey and systematic omissions was also dealt with.

Job demands

Three indicators of job demands were included in the present study. *Emotional demands* was measured using a 4-item scale developed specifically for healthcare professions by De Jonge *et al.* (1999). Participants were asked to indicate on a 5-point scale how often they were confronted with 'death', 'illness or any other human suffering', 'aggressive patients', and 'troublesome patients' in their work. Response categories ranged from (1) 'never' to (5) 'always'. Cronbach's alpha for this scale across the 10 countries that participated in the European NEXT study ranged from 0·64 to 0·78. *Quantitative demands* was assessed using four items of the quantitative demand scale of the Copenhagen Psychosocial Questionnaire(COPSOQ; Kristensen 2000; 'How often do you lack time to complete all your work tasks?', 'Can you pause in your work whenever you want?', 'Do you have to work very fast?', 'Is your workload unevenly distributed so that things pile up?'). One item was added by the NEXT Study Group ('Do you have enough time to talk to patients?') to develop a scale that met the specific demands of employees in the nursing profession. Participants were asked to indicate their answer to each question using a 5-point rating scale (1 = hardly ever, 5 = always). Cronbach's alpha for this scale in the NEXT study ranged from 0·62 to 0·75. *Physical demands* was assessed by using a newly developed scale entitled 'lifting and bending' (Hasselhorn *et al.* 2003). The aim of this scale was to quantify the physical demands in the nursing profession and it consisted of eight items ('bedding and positioning patients', 'transferring or carrying patients', 'lifting patients in bed without aid', 'mobilizing patients', 'clothing patients', 'helping with feeding', 'making beds', 'pushing patient's beds, food trolleys, or laundry trolleys'). The response categories were (1) '0–1 times a day', (2) '2–5 times a day', (3) '6–10 times a day' (4) '>10 times a day'. The lifting index was comprised of a score for the first four items, added and divided by four and multiplied by 25. The bending index was comprised of a score for the remaining four items, added and divided by four and multiplied by 25. The possible range was set from 0 to 100. Cronbach's alpha for this scale in the NEXT study ranged from 0·79 to 0·93.

Work-family interference

Work-family interference was measured using the 5-item 'work to family conflict' scale developed by Netemeyer *et al.* (1996). An example item is: 'The amount of time my job takes makes it difficult to fulfil family responsibilities'. Respondents were asked to indicate on a 5-point scale how accurate the statements were in relation to their personal occupational situation, with response categories ranging from (1) total disagreement to (5) total agreement. In the NEXT study Cronbach's alpha for this scale ranged from 0·85 to 0·90.

General health

General health was measured using the 5-item COPSOQ scale (Kristensen 2000), which followed the suggestions by Ware and Sherbourne (1992) regarding the SF-36 (Short-Form Health survey) general health measure. An example item is: 'I am as healthy as anybody I know'. A 5-point rating scale was used, ranging from (1) poor to (5) excellent. Cronbach's alpha in the NEXT study ranged from 0·72 to 0·77.

Ethical considerations

The NEXT study design was approved by the ethics committee of the University of Wüppertal in Germany. Questionnaires were distributed and returned as described earlier, and return of a completed questionnaire was taken as consent to participate in the study.

Data analysis

Our panel data were analysed with covariance structure modelling using the AMOS 7 computer programme (Arbuckle 2006). Each of the model components was included as a latent factor that was operationalized by the scale scores of the respective indicators, as described above. The measurement error of the one indicator factors was constrained to be equal to: variance (1 – reliability) (Jöreskog & Sörbom 1993).

By means of a cross-lagged structural equation model approach, a number of competing models were fitted to the data in several steps. First, a so-called stability model (Model 1) without cross-lagged structural paths but with temporal stabilities, specified as correlations between the constructs for each possible pair of measurement waves (see Pitts *et al.* 1996), and synchronous correlations was specified. Second, this stability model was compared with three more complex models that were nearest in likelihood to the hypothesized structural model:

Model 2: Identical to Model 1 but that also includes cross-lagged structural paths from T1 job demands to T2 WHI and general health. Additionally, this model includes cross-lagged structural paths from T1 WHI to T2 general health. This represents the *causality model*.

Model 3: Identical to Model 1 but that also includes cross-lagged structural paths from T1 general health to T2 WHI. Additionally, this model includes cross-lagged structural paths from T1 general health and WHI to T2 job demands. This represents the *reversed causation model*.

Model 4: Includes reciprocal relationships between job demands, WHI, and general health (including all paths of Models 2 and 3). This is the *reciprocal model*.

All models had the restriction that the measurement errors of the same indicators of job demands collected at different time points were allowed to covary over time (e.g. a covariance was specified between the measurement errors of emotional demands at T1 and T2). While in cross-sectional data measurement errors should generally not covary, in longitudinal measurement models the measurement errors corresponding to the same indicator *should* covary over time. According to Pitts *et al.* (1996), this specification of covariance between errors of measurement accounts for the systematic (method) variance associated with each specific indicator. Failing to specify the covariances between the measurement errors leads to high stability coefficients, and a poor fit of the model.

The various nested models were compared by means of the chi-square test (Jöreskog & Sörbom 1993). Besides the chi-square statistic, we assessed the goodness-of-fit index (GFI), and the root mean square error of approximation (RMSEA). Furthermore, AMOS provides several fit indices that reflect the discrepancy between the hypothesized model and the baseline, null model. In general, models with fit indices $>0{\cdot}90$ and RMSEA $<0{\cdot}08$ indicate a reasonable fit between the model and the data (Browne & Cudeck 1993). In our analyses, the Tucker–Lewis Index (TLI), and the Comparative Fit Index (CFI) were also used. Marsh *et al.* (1996) recommended the latter two indices, because they are less dependent on sample size compared with the chi-square statistic and GFI. The TLI and CFI indices should have values of 0·90 or higher (Hoyle 1995).

Preliminary analyses showed that socio-demographics (included as covariates) were not systematically related to the model variables, and did not modify the results of the model testing. This outcome also appeared to apply to gender. Therefore, to facilitate model estimation, the demographics were excluded from all further analyses.

Results

Prior to the model testing, the means, standard deviations, Cronbach's alpha coefficients and bi-variate correlations (including test-retest correlations) were computed (see Table 1). The *P*-values of the correlations have been adjusted using Bonferroni correction ($P < 0{\cdot}001$). As can be seen from Table 1, all variables have test–retest reliabilities of at least 0·48. The highest test–retest reliabilities resulted for emotional demands, lifting and bending followed by quantitative demands and general health, and finally by WHI. This means that WHI and its concomitants are relatively stable experiences.

Table 2 displays the overall fit indices of the competing models. In general, all models [except for Model 1 (M1), that is, the stability model] indicate a good fit, as all fit indices are $\geq 0{\cdot}95$, and the ratio between the chi-square statistic and the number of degrees of freedom is relatively low. We will first concentrate on the model comparisons.

The causality model (M2) proved to be superior to the stability model (M1), Delta $\chi^2 = 45{\cdot}41$, d.f. = 3, $P < 0{\cdot}001$. This suggests that the inclusion of cross-lagged paths from job demands to WHI and general health, as well as from WHI to general health is substantial. Additionally, the reversed causality model (M3) fitted statistically significantly better to the data than the stability model, Delta $\chi^2 = 50{\cdot}24$, d.f. = 3, $P < 0{\cdot}001$. This indicates that the model with the cross-lagged paths from general health to WHI, as well as from general health and WHI to job demands, also showed a better fit to the data than the

Table 1 Means, standard deviations, reliability coefficients (Cronbach's alpha; in italics on the main diagonal), and correlations between the model variables, $N = 946$

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
Time 1												
1 Emotional demands	3·51	0·52	*0·66*									
2 Quantitative demands	3·04	0·53	0·24***	*0·69*								
3 Physical demands	29·43	19·84	0·19***	0·27***	*0·84*							
4 Work-home interference	2·14	0·79	0·11***	0·22***	0·12***	*0·84*						
5 General health	0·72	0·15	−0·01	−0·10***	−0·08	−0·23***	*0·70*					
Time 2												
6 Emotional demands	3·40	0·52	0·67***	0·16***	0·16***	0·10***	−0·05	*0·64*				
7 Quantitative demands	2·96	0·52	0·20***	0·58***	0·22***	0·20***	−0·12***	0·28***	*0·67*			
8 Physical demands	24·19	15·75	0·14***	0·24***	0·67***	0·07	−0·03	0·18***	0·27***	*0·81*		
9 Work-home interference	2·21	0·79	0·07	0·19***	0·12***	0·48***	−0·20***	0·14***	0·27***	0·06	*0·88*	
10 General health	0·70	0·15	−0·01	−0·06	−0·02	−0·18***	0·59**	−0·06	−0·12***	0·00	−0·22***	*0·70*

P-values were adjusted by the Bonferroni method.
$^{***}P < 0{\cdot}001$.

Table 2 Goodness-of-fit indices for the alternative work-home interference models, $N = 946$

Model	χ^2	d.f.	*P* value	AGFI	RMSEA	TLI	CFI
M1. Stability model	151·97	27	0·001	0·93	0·07	0·92	0·95
M2. Causality model (JD → WHI/GH, WHI → GH)	106·56	24	0·001	0·95	0·06	0·94	0·97
M3. Reversed causality model (GH → WHI/JD, WHI → JD)	101·73	24	0·001	0·95	0·06	0·94	0·97
M4. Reciprocal model	34·66	21	0·031	0·98	0·03	0·99	0·99
Null model	2603·88	45	–	0·55	0·25	–	–

χ^2, chi-square; d.f., degrees of freedom; AGFI, adjusted goodness-of-fit index; RMSEA, root mean square error of approximation; TLI, Tucker–Lewis Index; CFI, Comparative Fit Index; JD, job demands, WHI, work-home interference, GH, general health.

model including only temporal stabilities and synchronous correlations (M1).

The chi-square difference test regarding the stability model vis-à-vis the *reciprocal* model (M4) revealed that the addition of reciprocal effects statistically significantly improved the stability model, Delta $\chi^2 = 117{\cdot}31$, d.f. = 6, $P < 0{\cdot}001$. Moreover, the model including the cross-lagged reciprocal relationships among the variables resulted in a statistically significantly better fit to the data compared with the causality model (M2, including only cross-lagged paths from job demands to WHI and general health as well as from WHI to general health), and the reversed causality model (M3, with only cross-lagged paths from general health to WHI, as well as from general health and WHI to job demands). The results of the chi-square difference tests for both comparisons (M2 vs. M4 and M3 vs. M4) are Delta $\chi^2 = 71{\cdot}90$, d.f. = 3, $P < 0{\cdot}001$, and Delta $\chi^2 = 67{\cdot}07$, d.f. = 3, $P < 0{\cdot}001$ respectively. This means that the theoretical model including cross-lagged *reciprocal* relationships between job demands, WHI and general health fits best to the empirical data.

We will now discuss the specific structural relationships that resulted from these models. Hypothesis 1 asserted that job demands will have lagged positive effects on WHI and lagged negative effects on general health, and that WHI will have a lagged negative effect on general health. The model that includes these causal relationships, i.e. the causality model (M2), resulted in statistically significant lagged and positive effects of T1 job demands on T2 WHI. However, T1 job demands appeared to be unrelated to T2 general health. Additionally, T1 WHI had a negative lagged effect on T2 general health (see Figure 1). These findings partially support our first hypothesis, as we found statistically significant lagged effects of job demands on WHI and of WHI on general health; however, we found no effects of job demands on general health over time.

Hypothesis 2 stated that general health will have a lagged negative effect on WHI, and that general health and WHI will have lagged effects on job demands. The model including these reversed causal paths (M3), also resulted in several statistically significant cross-lagged structural relationships. Specifically, T1 general health had a negative impact on T2 WHI, as well as on T2 job demands. Moreover, T1 WHI positively influenced T2 job demands. These findings mean that our second hypothesis was substantiated, as we found

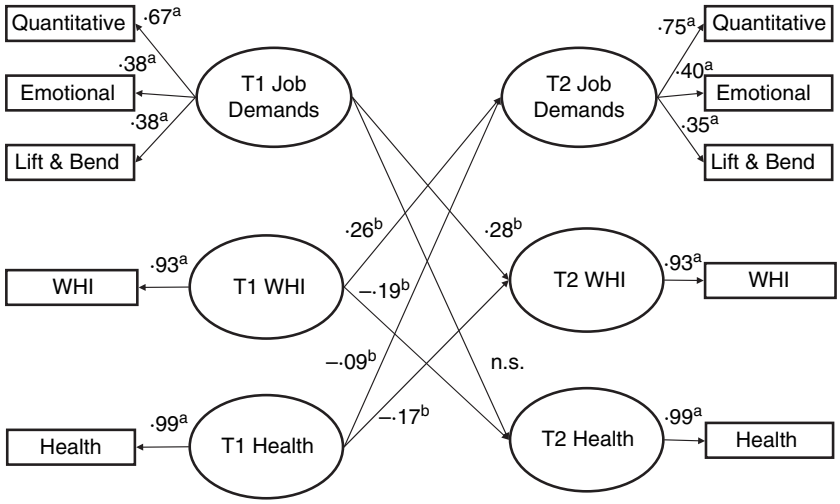

Figure 1 Standardized solution (maximum likelihood estimates) of the reciprocal model for WHI, $N = 946$. Autocorrelations and synchronous correlations are omitted for the sake of clarity. Factor loadings [a] are depicted above the arrows pointing at the indicators of the model variables. Standardized regression weights [b] are depicted above the arrows indicating the structural relationships.

that employees with better general health experienced less WHI and job demands over time, and those with more interference between work and home domains, reported also more pressure at work. The statistically significant paths of the reciprocal model (M4) overlap with those of the causality (M2) and reversed causality (M3) models and are displayed in Figure 1.

Because T1 job demands were unrelated to T2 general health, mediation in the sense of Baron and Kenny (1986; cf. first condition) of WHI in the relationship job demands-general health over time could not be tested. However, we could still examine whether job demands have indirect effects on general health over time via WHI (Mathieu & Taylor 2006). This was indeed the case because, as the causal model showed, T1 job demands were statistically significantly related to T2 WHI; and T1 WHI was statistically significantly related to T2 general health. The indirect effect of T1 job demands on T2 general health through WHI was 0·04 and significant (Sobel = 3·02, $P < 0·002$). Thus, WHI is indeed an intervening variable in the relationship between job demands and general health over time.

Because T1 general health was related to T2 job demands, there was a direct effect to be mediated in the sense of Baron and Kenny (1986). As the results of the reversed causal model showed, the relationships between T1 general health – T2 WHI, and T1 WHI – T2 job demands were statistically significant. Moreover, the effect of T1 general health on T2 job demands dropped from −0·28 to −0·09 after the inclusion of WHI as a mediator. The indirect effect of T1 general health on T2 job demands was 0·03 and statistically significant (Sobel = 3·22, $P < 0·001$). Thus, WHI is a mediator in the (reversed) causal relationship between general health and job demands over time.

Discussion

Study limitations

This study has some limitations. First, all data were collected using questionnaires, opening up the possibility of response set consistencies. As we used self-report measures both for the predictor variables, i.e. job demands, for WHI (the mediator) and for the outcome variable, i.e. general health, a common-method bias may exist (Doty & Glick 1998, Podsakoff *et al.* 2003). It might be interesting to gather data on both nurses' self-assessments and supervisors' assessments to compare their perceptions of the stressors nurses are experiencing, the amount of job resources, their WHI and their health.

In this study, we focused specifically on nurses, and therefore the findings are highly relevant for this particular group. To increase generalization across healthcare settings, participants were sampled across three kinds of health care institutions, that is, hospitals, nursing homes, and home care institutions. We think that our results are noteworthy and provide challenges for future research and cross-validation in different professional settings.

Discussion of results

As the nursing profession is characterized by a high workload and emotionally demanding interactions with patients, strain

and chronic stress are quite common. The central aim of the present study was to test the hypothesis that such working conditions may eventually result in a 'loss spiral' (Hobfoll 1989). More specifically, we investigated whether increasing job demands evoke more WHI and consequently general health deterioration, and whether general health, in turn, results in favourable perceptions of job demands and reduced WHI over a 1-year time period.

While several longitudinal approaches have focused on (parts of) the stressor → WHI → strain model, research including general health as the outcome variable has not been undertaken previously. Moreover, as we have tested the validity of a model that includes opposite pathways, i.e. a reversed causation model, our study adds to current knowledge as regards the directions in the pattern of relationships between the variables of interest. To take into account the wide variety of possible job demands, we included emotional, quantitative and physical demands in our research model.

Our findings strongly support the idea of cross-lagged reciprocal relationships between job demands, WHI and general health over time. In addition, we found that WHI plays an intervening role in the *reciprocal* relationship between job demands and health. These outcomes contribute to the literature on the stressor → WHI → strain model in several ways. They suggest that WHI is an explanatory mechanism for the relationship between job demands and health. Earlier longitudinal studies also confirmed such a role for WHI between demanding work characteristics and outcomes such as exhaustion (Demerouti *et al.* 2004, Peeters *et al.* 2004), or between stress and turnover intentions (Kelloway *et al.* 1999). WHI is neither a stressor nor an outcome but seems to constitute the link between what happens at work and general, domain-unspecific health (Geurts & Demerouti 2003).

Given the fact that WHI was found to mediate the relationship between job demands and health, it is important to ensure that nurses are enabled to balance their work and family demands, just like their level of job demands has to be taken care of. Nurses' psychological well-being and health appear to be dependent on their capabilities to fine-tune their professional and private responsibilities. Their capabilities to cope with often contradictory needs have strong implications for their current and future employability (see Van der Heijden *et al.* 2005). In the light of the enormous shortage of healthcare staff (Aiken *et al.* 2002, Sjögren *et al.* 2004), both individual employees and management in healthcare organizations ought to be much more attentive to prevent sustained periods of imbalance between work and home demands, and consequently serious health problems.

Moreover, given the reversed causation that we have found, in cases of already worsened health it is highly important that attention is paid to preventing the risk of a 'loss spiral'. As the reversed causation signifies that reduction in general health will, in turn, give rise to higher job demands and WHI, and so on, nurses under these circumstances may end up in a downward spiral, with an increasing deterioration of their working lives, their private lives and personal health.

Our study responds to multiple calls for longitudinal studies in the work-family interface literature (e.g. Casper *et al.* 2007). As Casper *et al.* suggested, longitudinal designs help researchers understand when relations between work-family conflict and other constructs are bi-directional or demonstrate reverse causality. Indeed, similar to earlier studies (Demerouti *et al.* 2004, Kinnunen *et al.* 2004), we found that diminished health can intrude in the work situation through WHI, which again represents the linking mechanism.

Our data strongly support the general assumption about the 'loss spiral'. It seems that the higher nurses' job demands, the higher their levels of WHI, and the more likely the possibility that general health deteriorates over time. In turn, reduction in general health gives rise to higher job demands and WHI, which may even aggravate nurses' general health, and so on. This vicious circle may, following immediate health problems, lead to more sick leave and even to premature exit from the nursing profession. Obviously, this situation is very worrisome in times of demographic changes that have led to a decline in the number of graduates entering the profession, an ageing nursing workforce, and an increased need for care as the 'baby boomer' generation approaches retirement (Taunton *et al.* 1997, North *et al.* 2005). As a consequence, most western countries are facing more or less serious nurse shortages (Aiken *et al.* 2002, Sjögren *et al.* 2004).

It is extremely important to protect nurses from this vicious circle, as neglecting the stressor → WHI → strain framework increases the negative impact because the burden for the remaining nurses (those who are not on sick leave and have not left the profession) will accordingly increase (a self-fulfilling prophecy). A supportive social work environment, both in terms of supervisory support (see also Taunton *et al.* 1997, Boyle *et al.* 1999) and a satisfying social support network of colleagues, is of great importance in the light of nurses' well-being and other positive work outcomes (B.I.J.M. Van der Heijden, K.L. Van Dam & the NEXT Study Group scientifically coordinated by H.M. Hasselhorn, unpublished data). Previous research has already indicated that when it comes to situations of psychological stress, colleagues are a very important source of support, particularly

What is already known about this topic

- Nursing is associated with high levels of emotional, cognitive and physical strain and is, accordingly, characterized by a high risk for ill health.
- There is a lack of research into the way negative work-home interference is embedded in the stressor–strain relationship.
- While several longitudinal approaches have addressed (parts of) the stressor → work-home interference → strain model, none has dealt with the impact of work-home interference on general health.

What this paper adds

- Strong support for the idea of cross-lagged reciprocal relationships between job demands, work-home interference and general health over time.
- Work-home interference plays an intervening role in the reciprocal relationship between job demands and health.
- The higher nurses' job demands, the higher is their level of work-home interference and the more likely is a general health deterioration over time, in turn giving rise to higher job demands and work-home interference, which may even aggravate the nurses' general health, and so on.

when that kind of support is lacking at an institutional level (Kirpal 2004). Moreover, healthcare organizations need to focus on buffering the negative effects that are inherent to the stressor → WHI → strain framework by providing equitable rewards and by enabling nurses to participate in decision-making (see Demerouti *et al.* 2000).

In particular, nurses facing serious labour shortages in their specific healthcare organization will 'suffer' in the long-term, especially if they have low self-perceived employability (see Van der Heijde & Van der Heijden 2006) and do not see possibilities to 'escape'. These nurses are particularly vulnerable to impaired health as they are the ones who believe that they cannot easily combat the negative spiral of increasing job demands and are afraid that escaping the spiral, for example by means of sick leave, will result in future job loss and related career problems. They are, so to speak, stuck or condemned to stay in their current healthcare organization, resulting in a continuing loss spiral with more and more depletion of resources as they assume that they are indispensable, given both nurse–patient ratios and the lack of career potential that is needed to apply for another job.

Recommendations for further research

In addition to self-perceived employability, both personality characteristics and ethical norms and values may moderate the effects of health problems on negative outcomes such as sickness leave or premature exit from the job, or even worse the profession. Further research is needed, for instance using the 'Big Five' or the 'Five Factor Model' (Costa & McCrae 1992) to understand which personality type is relatively more susceptible to health problems.

It may also be appropriate to use the job demands-resources (JD-R) model (Demerouti *et al.* 2001, Bakker & Demerouti 2007) that has proved to be applicable to many occupational and organizational settings as a guiding framework in future research regarding the stressor → WHI → strain model (Demerouti *et al.* 2000, 2001, Bakker & Demerouti 2007). While increasing job demands may lead to negative health outcomes, we expect that many employees are still able to cope with increasing job resources because of a specific constellation of personality dimensions that is favourable in this respect.

Conclusion

Our work has increased our insight in the stressor → WHI → strain model and supports the idea of reciprocal relationships among job demands, WHI, and health. Evidence for a model that includes opposite pathways implies that the problem of WHI interference, its antecedents and possible consequences is better understood. Moreover, our findings suggest different tracks for interventions. Healthcare organizations should monitor nurses' job demands, in terms of emotional, quantitative and physical demands and in relation to home constraints, while at the same time providing support for coping mechanisms and health protection. Nurses themselves must invest in their own health and further develop their time management skills to be able to buffer potential negative effects of increasing and enduring job demands, and a too high level of WHI. A nursing workforce that is in good physical and psychological shape is only conceivable when there is a constructive relationship between healthcare managers and staff and when there is dual responsibility for a sustainable workforce.

Acknowledgement

The NEXT study was financed by the European Commission within the Fifth Framework, Project ID: QLK-6-CT-2001-00475.

Author contributions

BH was responsible for the study conception and BH, EB & AB for the design. BH performed the data collection. BH, ED and AB performed the data analysis. BH, ED and AB were responsible drafting of the manuscript. BH, ED and AB made critical revisions to the paper for important intellectual content. BH, ED and AB provided statistical expertise. BH obtained funding. BH provided administrative, technical or material support. BH supervised the study. H-M H was the study coordinator.

References

Aiken L.H., Clarke S.P., Sloane D.M., Sochalski J.A., Busse R., Clarke H., Giovannetti P., Hunt J., Rafferty A.M. & Shamian J. (2001) Nurses' reports on hospital care in five countries [electronic version]. *Health Affairs* **20**, 43–53.

Aiken L.H., Clarke S.P., Sloane D.M., Sochalski J.A. & Silber J.H. (2002) Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Journal of the American Medical Association* **288**(16), 1987–1994.

Arbuckle J.L. (2006) *Amos 7.0 User's Guide*. SPSS Inc., Chicago, IL.

Bakker A.B. & Demerouti E. (2007) The job demands-resources model: state of the art. *Journal of Managerial Psychology* **22**, 309–328.

Bakker A.B., Killmer C.H., Siegrist J. & Schaufeli W.B. (2000) Effort-reward imbalance and burnout among nurses. *Journal of Advanced Nursing* **31**, 884–891.

Bakker A.B., Demerouti E., Taris T., Schaufeli W.B. & Schreurs P. (2003) A multi-group analysis of the job demands-resources model in four home care organizations. *International Journal of Stress Management* **10**, 16–38.

Baron R.M. & Kenny D.A. (1986) The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* **51**, 1173–1182.

Beck A.T. (1972) *Depression: Causes and Treatment*. University of Pennsylvania Press, Philadelphia, PA.

Bourbonnais R., Comeau M. & Vézina M. (1999) Job strain and evolution of mental health among nurses. *Journal of Occupational Health Psychology* **4**(2), 95–107.

Boyle D.K., Bott M.J., Hansen H.E., Woods C.Q. & Taunton R.L. (1999) Managers' leadership and critical care nurses' intent to stay. *American Journal of Critical Care* **8**(6), 361–372.

Browne M.W. & Cudeck R. (1993) Alternative ways of assessing model fit. In *Testing Structural Equation Models* (Bollen K.A. & Long J.S., eds), Sage, Newbury Park, CA, pp. 445–455.

Casper W.J., Eby L.T., Bordeaux C., Lockwood A. & Lambert A. (2007) A review of research methods in IO/OB work-family research. *Journal of Applied Psychology* **92**, 28–43.

Cheng Y., Kawachi I., Coakley E.H., Schwarts J. & Colditz G. (2000) Association between psychosocial work characteristics and health functioning in American women: prospective study. *British Medical Journal* **320**, 1432–1436.

Costa P.T. & McCrae R.R. (1992) *Revised NEO Personality Inventory (NEO-PI-R and NEO Five-Factor Inventory (NEO-FFI): Professional Manual*. Psychological Assessment Resources, Odessa, FL.

De Jonge J., Mulder M.J.G.P. & Nijhuis F.J.N. (1999) The incorporation of different demand concepts in the job demand-control model: effects on health care professionals. *Social Science and Medicine* **48**(9), 1149–1160.

De Jonge J., Dormann C., Janssen P.P.M., Dollard M.F., Landeweerd J.A. & Nijhuis F.J.N. (2001) Testing reciprocal relationships between job characteristics and psychological well-being: a cross-lagged structural equation model. *Journal of Occupational and Organizational Psychology* **74**, 29–46.

De Lange A.H., Taris T.W., Kompier M.A.J., Houtman I.L.D. & Bongers P.M. (2005) Different mechanisms to explain the reversed effects of mental health on work characteristics. *Scandinavian Journal of Work, Environment & Health* **31**, 3–14.

De Rijk A.E., Le Blanc P.M., Schaufeli W.B. & De Jonge J. (1998) Active coping and need for control as moderators of the job demand-control model: effects on burnout. *Journal of Occupational and Organizational Psychology* **71**(1), 1–18.

Demerouti E., Bakker A.B., Nachreiner F. & Schaufeli W.B. (2000) A model of burnout and life satisfaction amongst nurses. *Journal of Advanced Nursing* **32**(2), 454–464.

Demerouti E., Bakker A.B., Nachreiner F. & Schaufeli W.B. (2001) The job demands-resources model of burnout. *Journal of Applied Psychology* **86**(3), 499–512.

Demerouti E., Bakker A.B. & Bulters A.J. (2004) The loss spiral of work pressure, work-home interference and exhaustion: reciprocal relations in a three-wave study. *Journal of Vocational Behavior* **64**, 131–149.

Doty D.H. & Glick W.H. (1998) Common methods bias: does common methods variance really bias results? *Organizational Research Methods* **1**(4), 374–406.

Duxbury J. & Whittington R. (2005) Causes and management of patient aggression and violence: staff and patient perspectives. *Journal of Advanced Nursing* **50**(5), 469–478.

Erlen J.A. & Sereika S.M. (1997) Critical care nurses, ethical decision-making and stress. *Journal of Advanced Nursing* **26**(5), 953–961.

Estryn-Béhar M., Kaminski M., Peigne E., Maillard M.F., Pelletier A., Berthier C., Delaporte M.F., Paoli M.C. & Leroux J.M. (1990) Strenuous working conditions and musculo-skeletal disorders among female hospital workers. *International Archives of Occupational and Environmental Health* **62**(1), 47–57.

Frone M.R., Russell M. & Cooper M.L. (1997) Relation of work–family conflict to health outcomes: a four-year longitudinal study of employed parents. *Journal of Occupational and Organizational Psychology* **70**, 325.

Geurts S.A.E. & Demerouti E. (2003) Work/non-work interface: a review of theories and findings. In *The Handbook of Work and Health Psychology*, 2nd edn (Schabracq M., Winnubst J. & Cooper C.L., eds), Wiley, Chichester, pp. 279–312.

Grant-Vallone E.J. & Donaldson S.I. (2001) Consequences of work–family conflict on employee wellbeing over time. *Work & Stress* **15**, 214–226.

Greenhaus J.H. & Beutell N.J. (1985) Sources of conflict between work and family roles. *Academy of Management Review* **10**, 76–88.

Grzywacz J.G. & Marks N.F. (2000) Reconceptualizing the work-family interface: an ecological perspective on the correlates of

positive and negative spillover between work and family. *Journal of Occupational Health Psychology* **5**(1), 111–126.

Hambleton R.K. (1994) Guidelines for adapting educational and psychological tests: a progress report. *European Journal of Psychological Assessment* (Bulletin of the International Test Commission) **10**, 229–244.

Hasselhorn H., Tackenberg P. & Mueller B. (eds) (2003). *Work Conditions and Intent to Leave the Profession Among Nursing Staff in Europe*. Report no. 2003:7. A research project initiated by SALTSA (Joint Program for Working Life Research in Europe) and funded by the by the European Committee (QLK6-CT-2001-00475) National Institute for Working Life and the Swedish Trade Union in co-operation. Stockholm, Sweden.

Hobfoll S.E. (1989) Conservation of resources: a new approach at conceptualizing stress. *American Psychologist* **44**, 513–524.

Hobfoll S.E. (2001) The influence of culture, community, and the nested-self in the stress process: advancing conservation of resources theory. *Applied Psychology: An International Review* **50**, 337–421.

Hobfoll S.E. & Freedy J. (1993) Conservation of resources: a general stress theory applied to burnout. In *Professional Burnout: Recent Developments in Theory and Research* (Schaufeli W.B., Maslach C. & Marek T., eds), Taylor & Francis, Washington, DC, pp. 115–129.

Hockey G.R.J. (1997) Compensatory control in the regulation of human performance under stress and high workload: a cognitive-energetical framework. *Biological Psychology* **45**, 73–93.

Hoyle R.H. (1995) *Structural Equation Modeling: Concepts, Issues, and Applications*. Sage, Thousand Oaks, CA.

James L.R. & Tetrick L.E. (1986) Confirmatory analytic tests of three causal models relating job perceptions to job satisfaction. *Journal of Applied Psychology* **71**, 77–83.

Janiszewski Goodin H. (2003) The nursing shortage in the United States of America: an integrative review of the literature. *Journal of Advanced Nursing* **43**, 335–350.

Jöreskog K.G. & Sörbom D. (1993) *LISREL 8 Structural Equation Modeling With the SIMPLIS Command Language*. Scientific Software International, Chicago, IL.

Kahn R.L., Wolfe D.M., Quinn R.P., Snoek J.D. & Rosenthal R.A. (1964) *Organizational Stress: Studies in Role Conflict and Ambiguity*. Wiley, New York.

Kelloway E.K., Gottlieb B.H. & Barham L. (1999) The source, nature and direction of work and family conflict: a longitudinal investigation. *Journal of Occupational Health Psychology* **4**, 337–346.

Kinnunen U., Geurts S. & Mauno S. (2004) Work-to-family conflict and its relationship with satisfaction and well-being: a one-year longitudinal study on gender differences. *Work & Stress* **18**, 1–22.

Kirpal S. (2004) Work identities of nurses. Between caring and efficiency demands. *Career Development International* **9**(3), 274–304.

Kohn M.L. & Schooler C. (1982) Job conditions and personality: a longitudinal assessment of their reciprocal effects. *American Journal of Sociology* **87**, 1257–1286.

Kristensen T.S. (2000) *A New Tool for Assessing Psychosocial Factors at Work: The Copenhagen Psychosocial Questionnaire*. National Institute of Health, Copenhagen.

Le Blanc P., Bakker A.B., Peeters M.C.W., Van Heesch N.C.A. & Schaufeli W.B. (2001) Burnout in oncology care providers: the role of individual differences. *Anxiety, Stress, and Coping* **14**, 243–263.

Leiter M.P. & Durup M.J. (1996) Work, home, and in-between: a longitudinal study of spillover. *Journal of Applied Behavioral Science* **32**, 29–47.

Marsh H.W., Balla J.R. & Hau K.T. (1996) In an evaluation of incremental fit indices: a clarification of mathematical and empirical properties. In *Advanced Structural Equation Modeling: Issues and Techniques* (Marcoulides G.A. & Schumacker R.E., eds), Erlbaum, Mahwah, NJ, pp. 315–353.

Mathieu J.E. & Taylor S.R. (2006) Clarifying conditions and decision points for mediational type of inferences in organizational behavior. *Journal of Organizational Behavior* **27**, 1031–1056.

Meijman T.F. & Mulder G. (1998) Psychological aspects of workload. In *Handbook of Work and Organizational Psychology*, 2nd edn (Drenth P.J., Thierry H. & de Wolff C.J., eds), Psychology Press/Erlbaum, Hove, UK, pp. 5–33.

Netemeyer R.G., Boles J.S. & McMurrian R. (1996) Development and validation of work–family conflict and family–work conflict scales. *Journal of Applied Psychology* **81**(4), 400–410.

North N., Erasmussen E., Hughes F., Finlayson M., Ashton T., Campbell T. & Tomkins S. (2005) Turnover amongst nurses in New Zealand's district health boards: a national survey of nursing turnover and turnover costs. *New Zealand Journal of Employment Relations* **30**(1), 49–62.

Peeters M.C.W., De Jonge J., Janssen P.P.M. & Van der Linden S. (2004) Work-home interference, job stressors, and employee health in a longitudinal perspective. *International Journal of Stress Management* **11**(4), 305–322.

Pitts S.C., West S.G. & Tein J.Y. (1996) Longitudinal measurement models in evaluation research: examining stability and change. *Evaluation and Program Planning* **19**, 333–350.

Podsakoff P.M., MacKenzie S.B., Lee J.Y. & Podsakoff N.P. (2003) Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology* **88**, 879–903.

Reis Miranda D., Ryan D.W., Schaufeli W.B. & Fidler V. (eds) (1998) *Organisation and Management of Intensive Care*. Springer, Heidelberg.

Rippon T.J. (2000) Aggression and violence in health care professions. *Journal of Advanced Nursing* **31**(2), 452–460.

Russell S. (1999) An exploratory study of patients' perception, memories and experiences of an intensive care unit. *Journal of Advanced Nursing* **29**(4), 783–791.

Schwarzer R., Hahn A. & Jerusalem M. (1993) Negative effect in East German migrants: longitudinal effects of unemployment and social support. *Anxiety, Stress, and Coping* **6**, 57–69.

Sjögren K., Fochsen G., Josephson M. & Lagerström M. (2004) Reasons for leaving nursing care and improvements needed for considering a return: a study among Swedish nursing personnel. *International Journal of Nursing Studies* **42**, 751–758.

Sluiter J.K. (1999). *How About Work Demands, Recovery, and Health*. Unpublished Doctoral Thesis, University of Amsterdam, Amsterdam.

Taunton R.L., Boyle D.K., Woods C.Q., Hansen H.E. & Bott M.J. (1997) Manager leadership and retention of hospital staff nurses. *Western Journal of Nursing Research* **19**(2), 205–226.

Van der Heijde C.M. & Van der Heijden B.I.J.M. (2006) A competence-based and multi-dimensional operationalization and measurement of employability. *Human Resource Management* **45**, 449–476.

Van der Heijden B.I.J.M., Scholarios D., Bozionelos N., Van der Heijden C.M. & Epitropaki O. & the Indic@tor consortium (2005). *Report on Final Results. Indic@tor Report: A Cross-Cultural Study on the Measurement and Enhancement of Employability in Small and Medium-Sized ICT-Companies*. European Commission, Brussels.

Van Hooff M., Geurts S.A.E., Kompier M.A.J., Taris T.W., Houtman I.L.D. & Van den Heuvel F. (2005) Disentangling the causal relationships between work-home interference and employee health. *Scandinavian Journal of Work, Environment and Health* **31**, 15–29.

Van Hooff M., Geurts S.A.E., Kompier M.A.J. & Taris T.W. (2006) Work-home interference: how does it manifest itself from day to day? *Work & Stress* **20**, 145–162.

Ware J.E. & Sherbourne C.D. (1992) The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care* **30**(6), 473–483.

Zapf D., Dormann C. & Frese M. (1996) Longitudinal studies in organizational stress research: a review of the literature with reference to methodological issues. *Journal of Occupational Health Psychology* **1**, 145–169.

