

## **Psychosocial workload, work-family interference and health**

### **Determinants of sick leave in university employees**

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# **Psychosocial workload, work-family interference and health**

## **Determinants of sick leave in university employees**

Een wetenschappelijke proeve  
op het gebied van de Medische Wetenschappen

### **Proefschrift**

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**General introduction**





## GENERAL INTRODUCTION

A great deal of research has focused on the relationship between (psychosocial) workload and health (e.g. Van der Doef 2000; Shirom 2003). However, only a relatively small proportion of the variance in work-related health and sick leave can be explained by work-related characteristics (Klitzman et al. 1990). It is believed that private life characteristics also play a role. This thesis focused on the associations between work- and family-related characteristics, health-related characteristics and sick leave in a population of Dutch university employees.

### **‘New’ issues in occupational health**

Before the industrial revolution, work was primarily home-based and individuals’ work and family lives were totally integrated (Barnett 1998). The nature of work-family issues changed dramatically when industry left home and became concentrated in factories. At this point in time, work and family life became two separate domains and it was assumed that the domains did not have much influence on each other (Barnett 1998; Geurts et al. 1999). Segregation between ‘workers’ and ‘non-workers’ arose, which generally paralleled gender segregation: the husband had a paid job, while the wife took care of the home and children. This was especially the case in families with higher socio-economical status. In the lower and middle classes, however, not only the men needed jobs, but also many of the women and children, to earn enough money to pay for food and shelter.

Working in factories in the early days was sometimes dangerous, because of the terrible conditions, such as toxic vapours, high noise levels and enormous physical workload. Consequently, there were a lot of occupational diseases, working disabilities and deaths. Therefore, the first acts pertaining to occupational health especially aimed at improving working conditions, abolishing child labour in those younger than 12 years of age and reducing working hours especially in women and in children of 16 years of age and younger (Zegers 1999a). Protection of workers against dangerous situations was the central point in legislation until the nineteen fifties and sixties. In the mean time, mechanisation and automation had dramatically influenced the production processes. The work had become more and more mentally demanding, as opposed to physical and people were receiving more education (Zegers 1999b). Work quality became more important to employees. Not only safety and health formed central issues, but attention was also paid to social relationships and well-being at work. Psychological health problems, such as fatigue, emotional exhaustion and burnout started to play significant roles, and just like the ‘classical’ occupational health problems (e.g. lung diseases, noise-induced hearing loss and musculoskeletal complaints, et cetera), these ‘new’ diseases were important causes of sick leave.

## **Employees with chronic diseases**

Another topic of relevance that has recently entered the field of (Dutch) occupational health is care for employees with diminished capacity due to chronic diseases. People with a chronic disease often find that it has an effect on their capacity to participate in gainful employment (Baanders et al. 2002). Chronically ill persons may experience more or different problems in their employment situation than their colleagues without chronic diseases.

In the past few years, several changes have been made in social legislation to reduce the number of people who take early retirement or depend on disability pensions. Especially owing to the scanty labour force in recent times, efforts need to be made to include and retain as many persons as possible in the working population, including those with health problems (Kerkhofs et al. 2000). One of the measures introduced to achieve this is more objective and stringent examinations by social insurance physicians. Not only chronic diseases as such, but also ageing of the labour force in general are leading to higher numbers of workers with ill health. These employees may need extra attention from their employers, colleagues and occupational physicians to be able to keep working without too much sick leave. Therefore, it is important to find out which (psychosocial) work-related characteristics are associated with diminished health and sick leave in employees with chronic diseases compared to workers without chronic disease. Until now, very few studies have investigated these relationships.

## **Combining work and family life**

During the revival after World War II, the Dutch economy flourished in such a way that it was possible for all layers of society to adopt the 'traditional' situation of the husband having a paid job and the wife looking after the home and children. The labour movement had turned the family with one breadwinner into a basic facility (Zegers 1999b). Even the women in the lower socio-economical classes were often able to be 'stay at home mothers', because their husbands earned enough to provide for the family. Moreover, in the Netherlands, there is a strong belief that children should be brought up by their own parents and not by (paid) others. Especially the women are having difficulties placing the care for their children in the hands of others (Bekker 1999). These are some of the reasons why the participation of women in the labour force started rather late, compared to other European countries.

Emancipation waves in the second half of the twentieth century led to considerable increases in participation of women in the labour force (Bekker et al. 1999; Keuzenkamp and Hooghiemstra 2000). Whereas in 1987, only 35% of the women had a paid job for 12 hours or more a week, this was 55% in 2003 (Cuijpers et al. 2004). The division of unpaid work at home is closely related to the division of paid

employment. As women's share of paid employment rises, their share of unpaid work falls (Keuzenkamp and Hooghiemstra 2000). This is, nevertheless, primarily because women devote less time to (unpaid) domestic work, rather than because the men are making greater efforts at home (Cloïn and Boelens 2004). However, by means of national campaigns, the Dutch government is attempting to change the existing division patterns of household labour and child rearing and achieve fairer division of the responsibilities at home between the men and women (Kops et al. 2004).

Changes in the demographic profile of the workforce in Western countries, such as Western Europe and the USA have drawn a great deal of research interest to how individuals (especially women) combine the demands of work and family roles (Gutek et al. 1991; Kelloway et al. 1999). There is an ongoing debate about whether women who combine paid work with domestic tasks and bringing up children are more likely to suffer from detrimental effects on their health. A large part of the literature on the social determinants of women's health focused on the multiple roles of women and how a combination of these roles may be either advantageous (role enhancement) or disadvantageous (role strain) to their health (Bekker et al. 1999; Chandola et al. 2004). Women are often presumed to be suffering from the 'double burden', the burden due to being active in one's job and remaining responsible for domestic activities, including child care (Bekker et al. 1999; Gjesdal and Bratberg 2002). Even in countries with a long tradition of female labour participation, such as Finland and Sweden, women still seem to be responsible for more of the household tasks than men (Cloïn and Boelens 2004; Kinnunen et al. 2004). However, there is also evidence that mothers with paid jobs experience better health than 'stay at home mothers' (Verbrugge 1985; Waldron et al. 1998; Bekker et al. 1999). One possible explanation for this is the positive effects of the financial and social support obtained through paid work outside the home, in addition to the rewards of being a spouse and parent.

In the beginning, research into combining paid work and family issues was mainly concerned with how work schedules (e.g. shift work, weekend work, number of working hours) and family employment patterns (e.g. dual vs. single-earner families) affected the quality of family life (e.g. time spent on child rearing, housework and leisure activities) (Klitzman et al. 1990). In addition, many studies only addressed women (Barnett 1998; Waldron et al. 1998). Nowadays, it is also important to investigate the effects of combining paid work with family tasks on the quality of the working life. There is evidence that it may reduce job performance or job satisfaction and may increase intention to turnover to another job (Allen et al. 2000). Research has also been conducted into the relationships between work and care and various health outcomes, but very little attention has been paid to sick leave as an outcome measure (Jansen 2003). Moreover, owing to promotion campaigns to achieve a more equal division of domestic tasks between the partners, 'double burden' may also become a

detrimental phenomenon in men (Thomas and Ganster 1995). Therefore, it is important to investigate associations between work-related characteristics, family-related characteristics and health in women as well as in men.

### **Work-family interference**

Throughout the literature, diverse terminology has been used to describe the alleged tension between domestic chores and a paid job. A commonly used term is work-family interference (WFI). WFI is defined as 'a form of interrole 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.' (Greenhaus and Beutell 1985). Most studies on WFI have been conducted in Western Europe and the USA (Aryee 1992), but only few have been done in the Netherlands. Research findings from other European countries may not be entirely applicable to the Dutch situation. The labour participation of Dutch women did not start increasing until rather late and part-time work is much more common in the Netherlands, especially among women (Duyvendak and Stavenuiter 2004). Moreover, Dutch childcare facilities are still poorly developed, which makes it more difficult to combine having a family with paid work.

One point for concern that limits the growing body of knowledge pertains to the measurement of WFI. In the nineteen eighties, researchers have largely relied on measurements of WFI that did not distinguish between forms and directions of WFI (Greenhaus and Beutell 1985; Frone et al. 1992; Kelloway et al. 1999; Carlson et al. 2000). In our study, we used a multidimensional measure of WFI that takes the two directions ( $W \rightarrow FI$  and  $F \rightarrow WI$ ) as well as three forms (time-, strain- and behaviour-based WFI) into consideration (Carlson et al. 2000).

### **Relevance of research into work-family interference**

Psychosocial workload, family-related characteristics and work-family interference are expected to be important determinants of sick leave. Employers carry a significant portion of the cost of health care through the payment of health insurance premiums and in the form of lost working days due to illness or injury and lost productivity (Klitzman et al. 1990). Therefore, it is relevant to investigate the associations between psychosocial workload, family-related characteristics, WFI and some (psychological) health-related characteristics and sick leave. In the Netherlands, employers are obliged to pay an employee's salary until two years after the onset of sick leave. This means that long-term sick leave (that potentially leads to work disability) involves high financial cost for employers and society. In addition, it may result in lower quality of life for the employee, due to social and financial consequences. For these reasons, it is

important to prevent ill health, sick leave and working disability as much as possible. Research into the determinants of ill health and sick leave will enable the development of intervention programmes that aim to reduce sick leave.

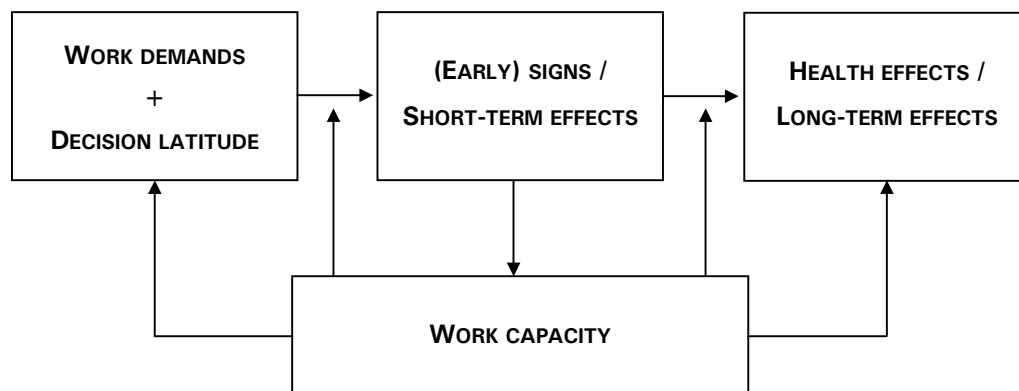
## RESEARCH QUESTIONS

The main research questions addressed in this thesis were:

- What is the contribution of various work-related characteristics to the explanation of (psychosocial) health-related characteristics?
- Do work-related and health-related characteristics differ between employees with chronic diseases and those without chronic diseases? Are there any differences in the associations between work- and health-related characteristics and sick leave?
- What is work-family interference and how can it be assessed by means of a questionnaire?
- What is the contribution of various family-related characteristics compared to work-related characteristics in the explanation of work-family interference, health-related characteristics and sick leave?

## Theoretical framework

Throughout this thesis, the models presented below have served as theoretical frameworks (separately or in combination). In occupational health research into the relationships between (psychosocial) workload, well-being and health, the Job Demand Model developed by Karasek (1979) has often been used. Johnson and Hall (1988) extended the model with a third dimension into the Job Demand Control Support model. This model predicts that a combination of high job demands, low job decision latitude and low social support has the most negative effects on a person's health. The model 'Workload' has often been used in the Dutch literature and comprises a basic scheme for occupational health care and occupational health science (Van Dijk et al. 1990). In this dynamic model, the theoretical relationships are described between work demands (i.e. job content, working conditions, social relationships, employment terms) and health effects. It is therefore comparable with the Job Demand Control Support model. However, in the model 'Workload', distinction is made between (early) signs/symptoms and more long-term health effects (Figure 1). Under normal circumstances, adequate recovery will take place before the next working day, but when work demands and work capacity have been imbalanced over a longer period of time, recovery may not be sufficient and detrimental health effects may occur. In several chapters of this thesis, we distinguish between short-term and long-term effects in our health-related characteristics.



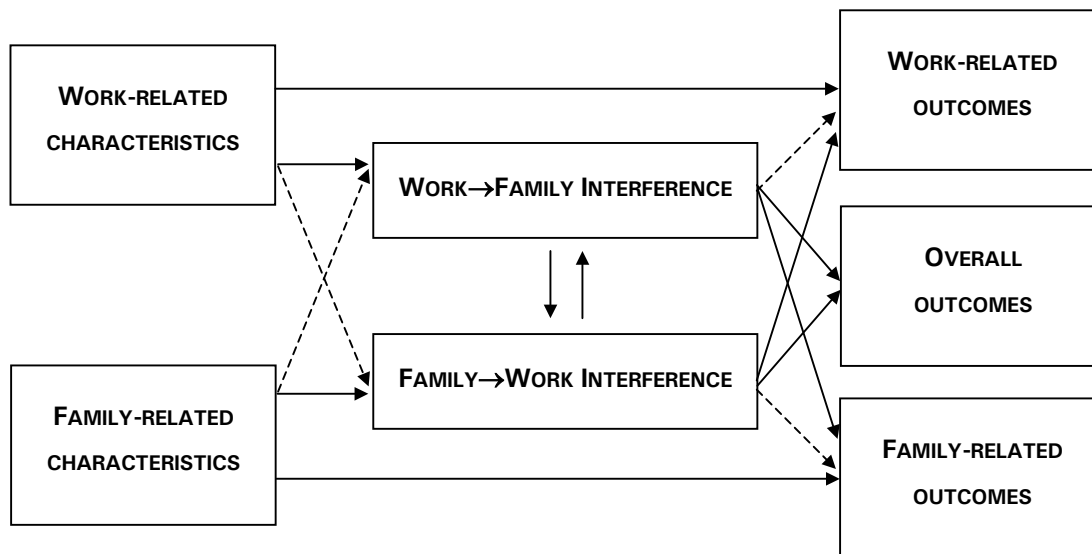
**Figure 1** Model 'Workload' (Van Dijk et al. 1990).

However, work-related characteristics are not the only determinants that can cause ill health and sick leave (Klitzman et al. 1990). We hypothesized that in addition to psychosocial work characteristics, family-related characteristics and conflict between work and family roles (or work-family interference) are determinants of ill health.

Most of the literature on work-family interference did not originate from occupational health, but from the social and management sciences. An early model was proposed by Klitzman et al. (1990) that showed relationships between stressors at work, stressors outside of work, WFI and health. Nevertheless, most researchers refer to the model presented by Frone et al. (1992), who were among the first to make a distinction in direction of WFI. They stated that work-related characteristics are the antecedents of work→family interference (W→FI), whereas family-related characteristics contribute to family→work interference (F→WI). These relationships are depicted in Figure 2 as solid lines. Additional relationships have been proposed by Kinnunen and Mauno (1998). They stated that work-related characteristics can also be related to F→WI as well, but to a smaller extent than to W→FI. The same applies to the relationships between family-related characteristics and W→FI.

## OUTLINE OF THIS THESIS

This thesis elaborates on three themes. An explorative study focused on the associations between psychosocial workload and various (psychosocial) health-related characteristics. A second theme concerned the comparison of employees with chronic diseases to those without, while the third theme comprised work-family interference.



**Figure 2** Conceptual model of the antecedents and outcomes of work→family interference and family→work interference as proposed by Kinnunen and Mauno (1998).

### Explorative study

Our first theme was addressed in an explorative study on associations between work- and health-related characteristics in a specific population, viz. university employees (*Chapter 2*). Secondary analyses were performed on existing data collected within the framework of an occupational risk assessment within a Dutch university. The model ‘Workload’ (Figure 1) was used to describe the associations between various work-related characteristics, personal characteristics and various health-related characteristics. It has been hypothesized that health-related characteristics occur in different phases: firstly psychosocial workload contributes to feelings of diminished well-being at work, followed by increased tension and emotional exhaustion and possibly also by increased perceived health complaints. Based on the general norm of dividing university employees in two groups, namely non-scientific personnel (NSP) and scientific personnel (SP), we conducted separate analyses on these two groups to examine differences between them.

The results of this explorative study showed that it was possible to detect associations between work- and health-related characteristics within this specific population. Therefore, all the university employees were sent a new questionnaire that not only inquired about work- and health-related characteristics, but also about family-related characteristics, work-family interference and sick leave. All the other chapters that present quantitative results were based on data obtained via this questionnaire.

## **Employees with chronic diseases**

The second theme concerned differences between employees with chronic diseases and those without. In *Chapter 3*, we investigated whether the chronically ill workers (CIWs) took more sick leave than the non-chronically ill workers (NCIW). We also explored which health- and work-related characteristics were associated with the sick leave patterns in these two groups. In *Chapter 4*, associations were investigated between various work-related characteristics and fatigue, emotional exhaustion and perceived health complaints, again with separate analyses on the CIWs and NCIW.

## **Work-family interference**

The third theme regarded work-family interference (WFI). First, a literature review was performed that provided an overview of the hypotheses on relationships between work, taking care of household and children and health (*Chapter 5*). We also investigated how WFI was measured in various studies and which research models were used to investigate the relationships between work, family issues, WFI and various outcome measures. It could be concluded that there were two directions of WFI, namely work→family interference (W→FI) and family→work interference (F→WI). Within each direction, three forms of interference could be distinguished: time-based, strain-based and behaviour-based.

In *Chapter 6*, we calculated the associations between various work- and family-related characteristics and these six dimensions of WFI. In addition, we searched for evidence in favour of the model presented by Kinnunen and Mauno (1998) (Figure 2) as opposed to the model formulated by Frone et al. (1992) and we wanted to find out whether there were different patterns of associations in the men and women.

In *Chapter 7*, we used structural equation modelling to investigate associations between antecedents (i.e. work- and family-related characteristics) and outcomes (fatigue, emotional exhaustion, perceived health complaints and sick leave) of WFI. Again, separate analyses were conducted on the men and women. For these analyses, the model 'Workload' was integrated into the work-family interference model. Fatigue, emotional exhaustion and perceived health complaints were the early signs or short-term effects for diminished health. Sick leave was considered a long-term effect.

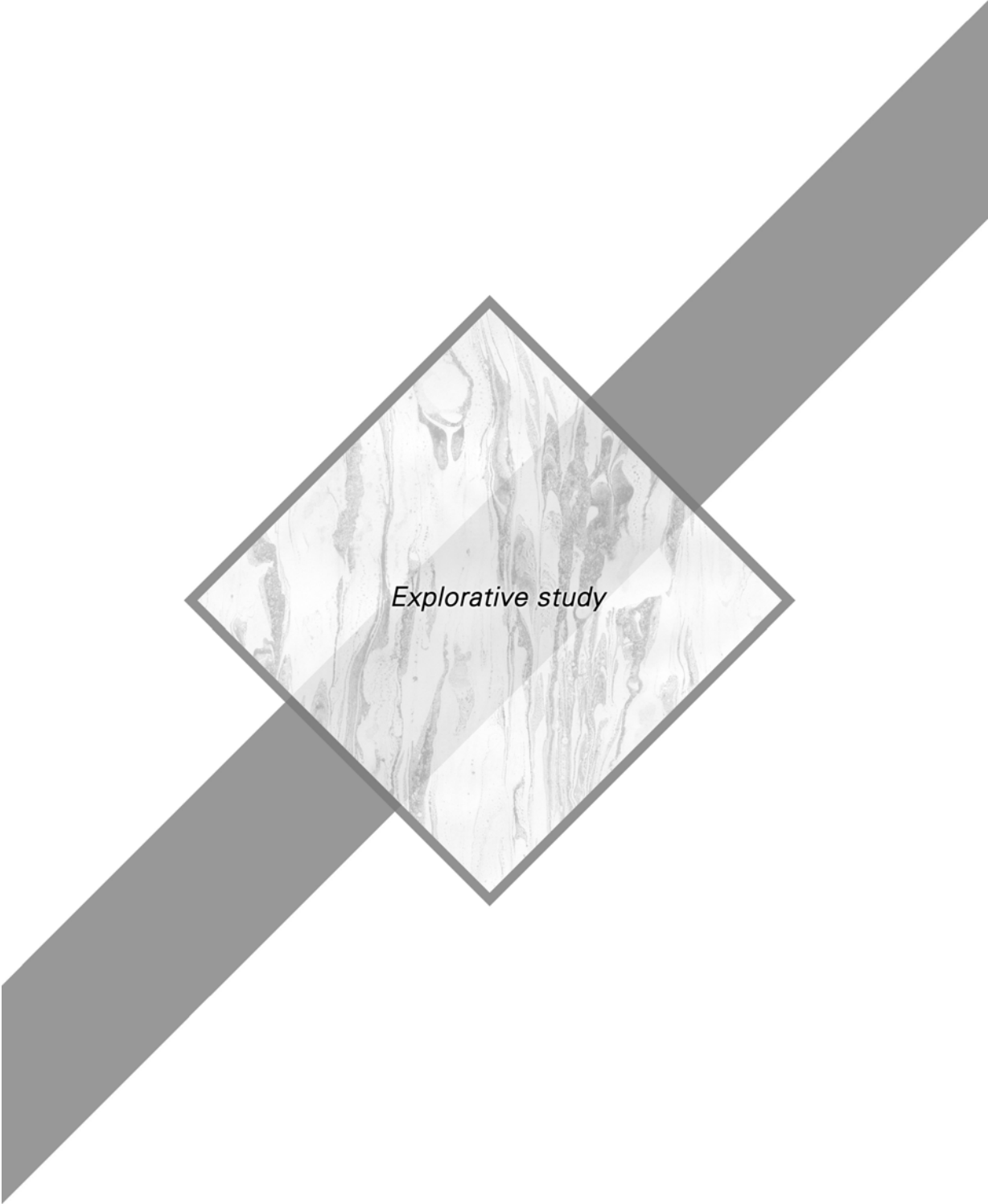
Finally, *Chapter 8* presents the General discussion and conclusions of this thesis. Recommendations for further research and practice are given in this chapter. After this, we present a summary of this thesis.



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## **Work stress and health effects among university employees**

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## ABSTRACT

**Objectives:** (i) To investigate the contribution of work-related and personal characteristics to the explanation of health effects among university personnel; (ii) to investigate the differences between scientific personnel (SP) and non-scientific personnel (NSP) and (iii) to investigate whether health effects occurred one after another. **Methods:** The psychosocial workload of employees at a Dutch university (N=2522) was investigated by means of a questionnaire. A model was constructed in which several work-related and personal characteristics were set out against health effects. The latter were assumed to occur in phases: decreased well-being at work as an early effect, followed by increased tension and emotional exhaustion, and possibly also by increased perceived health complaints. The contribution of work-related and personal characteristics to the explanation of health effects was investigated by means of linear regression analyses, with separate analyses on the SP and NSP. **Results:** Positive work-related aspects, especially professional expertise and work variety contributed to the explanation of well-being at work. The major contributors to tension and emotional exhaustion were negative aspects such as work pressure. Besides the negative aspects, the major contributors to the explanation of perceived health complaints were sex, age and other health effects. In the NSP, social support contributed to the explanation of tension and emotional exhaustion, but not in the SP. The explained variance of well-being at work by the positive work aspects in the NSP was much higher than that in the SP. To investigate whether health effects occurred one after another, explained variance was considered: explained variance in well-being at work was much higher than in perceived health complaints; emotional exhaustion and tension were in between. **Conclusions:** Contrary to expectations, decision latitude and social support only played minor roles. Also the differences between the SP and NSP were smaller than expected. As individual condition and burden outside work also influence health effects, we recommend including relevant personal factors in future studies.

**Keywords:** work stress, health effects, university personnel

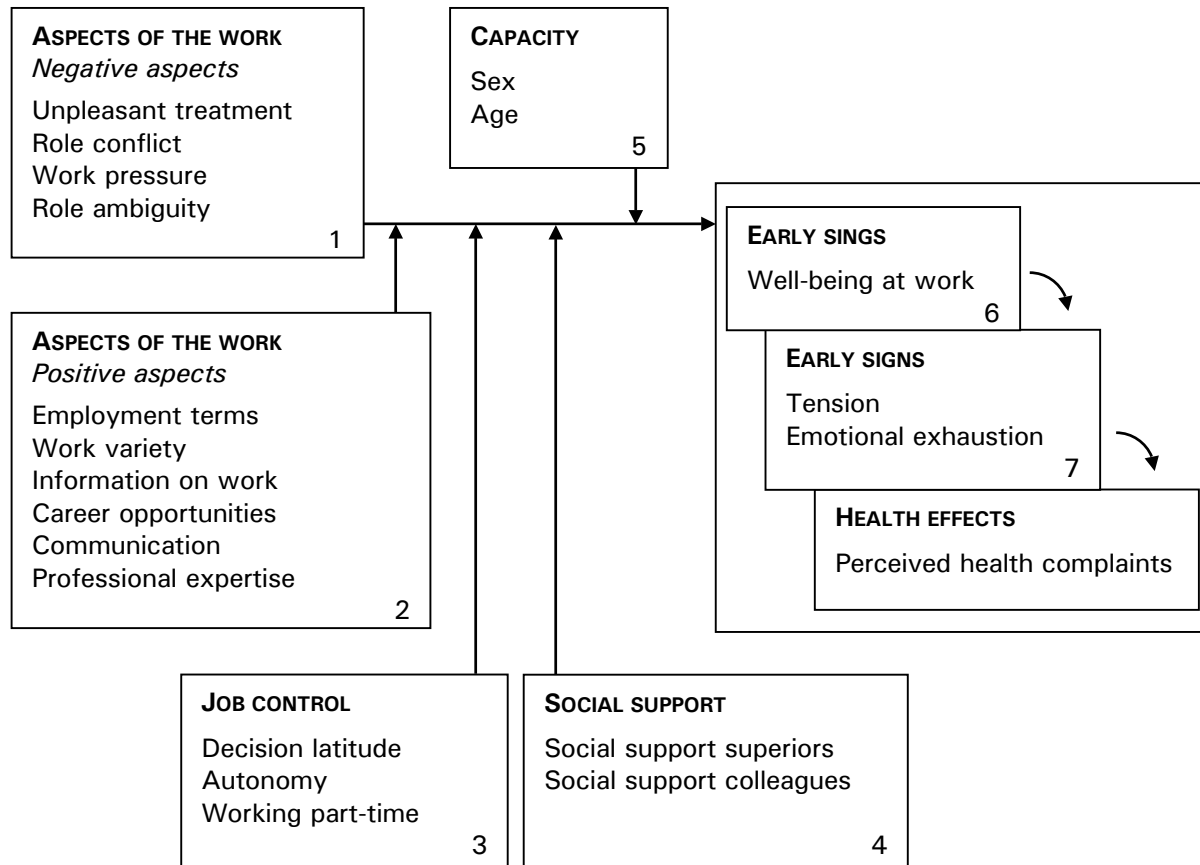
NCGM Donders, JWW van der Gulden, JW Furer, B Tax, EW Roscam Abbing. Werkstress en gezondheidseffecten bij universitair personeel [in Dutch]. *Tijdschr Gezondheidswet* 2002;80(2):100-135

NCGM Donders, JWW van der Gulden, JW Furer, B Tax, EW Roscam Abbing. Work stress and health effects among university personnel. *Int Arch Occup Environ Health* 2003;76(8):605-613

## INTRODUCTION

In research into the relationship between (psychological) workload and well-being the Job Demand Model developed by Karasek (1979) has frequently been used. This model assumes that psychological stress reactions in the work place can chiefly be explained by high job demands and low job decision latitude. A combination of these two job characteristics is assumed to have a stronger effect on health and well-being than either of the two separately (Karasek 1979; De Jonge and Furda 1995; De Jonge et al. 1996; Van der Doef 2000). Johnson and Hall (1988) extended the model with a third dimension, into the Job Demand Control Support model. This model predicts that a combination of high job demands, low job decision latitude and low social support from colleagues and superiors have the most negative consequences on a person's health. Many studies have shown that (job) stressors can lead to health effects. They form a risk for, e.g. high blood pressure, cardiovascular disease, decreased resistance and musculoskeletal complaints. Major psychological disorders include tension, depression, fatigue and emotional exhaustion. In the long term, these complaints can lead to a person being incapacitated for work (Kompier and Marcelissen 1990; Kompier and Houtman 1995). Karasek's model also makes another assumption: so-called active jobs, i.e. with high job demands and high decision latitude, can give rise to intrinsic motivation, learning effects and personal growth (De Jonge and Furda 1995; De Jonge et al. 1996). However, a study by Van Veldhoven et al. (1999) showed that particularly employees with a relatively high score for work pace, work quantity and autonomy in their work reported the most tension-related complaints.

The Dutch literature describes a variation on the Job Demand Control Support model: the model 'Workload' (Van Dijk et al. 1990). This model has a global character and its level of specification depends on the application. Figure 1 shows a specification in which work-related and personal characteristics are related with health effects. In the model, distinction is made between (early) signs/symptoms and health effects (Van Dijk et al. 1990; Kompier and Houtman 1995). Figure 1 also makes this distinction: (psychosocial) workload firstly leads to diminished well-being at work, followed by increased tension and emotional exhaustion, and possibly also by an increase in perceived health complaints.



**Figure 1** Assumed relationship between work-related, personal characteristics and health effects.

University employees are often divided into scientific personnel and non-scientific personnel. Compared to the latter group, scientific personnel hold a different position: although their work pace is high, they often regard their work as being challenging and interesting, with high decision latitude and autonomy (Houtman et al. 1994). In Karasek's model (1979) this group falls under the 'active jobs'. Therefore, it can be assumed that these persons run less risk of negative health effects than persons who have highly demanding jobs with less decision latitude and less interesting work.

In this study, we made an inventory of the work-related characteristics, personal characteristics and health effects among scientific and non-scientific employees at a Dutch university. Our aim was to investigate which work-related and personal characteristics contributed to an explanation of the health effects and whether there were differences between scientific personnel and non-scientific personnel. In addition, we investigated whether health effects occurred in phases. For this purpose, secondary analyses were performed on existing data collected within the framework of an occupational risk assessment.



## METHODS

### Questionnaire and population

Within the framework of the risk assessment, a questionnaire was sent to 4642 employees from all units (i.e. faculty departments and services) at a Dutch university in the period 1996-1998. The questionnaire, called the well-being survey, comprised six sections that contained the various scales. The corresponding number of items and Cronbach's alpha are given between parentheses:

*Personal characteristics*: questions on sex, age, education level, employment category (2 questions), part-time or full-time employment.

*Work content*: work variety (3; 0.67), work pressure (8; 0.87), professional expertise (2; 0.87), autonomy (10; 0.89).

*Task content*: role conflict (5; 0.73), role ambiguity (5; 0.79), information on work (3; 0.74).

*Work relations*: social support from superiors (5; 0.87), social support from colleagues (5; 0.80), communication (4; 0.87), decision latitude (9; 0.87), unpleasant treatment/discrimination (7; 0.68).

*Employment terms*: employment terms (5; 0.62), career opportunities (3; 0.66).

*Health and well-being*: perceived health complaints (10; 0.75), tension (4; 0.90), emotional exhaustion (4; 0.86), well-being at work (comprising 3 items: challenging work, involvement and satisfaction; 0.70).

Internal consistency was fair to good (De Jonge et al. 1995): Cronbach's alpha was  $<0.70$  only for work variety, unpleasant treatment/discrimination, employment terms and career opportunities.

During the construction of the well-being survey, it was aimed to produce a questionnaire that was well-suited to the specific employment circumstances and work relations within a university. For this purpose, we used scales from various existing and validated questionnaires: the Maastricht Risk Assessment Questionnaire (work variety, professional expertise) (De Jonge 1994), the Maastricht Autonomy Questionnaire (work pressure, autonomy) (De Jonge et al. 1995; De Jonge et al. 2000), Questionnaire Organisation Stress-D (role conflict, role ambiguity, social support from superiors, social support from colleagues, tension) (Bergers et al. 1986), Questionnaire on Experience and Evaluation of Work (information on work, communication, decision latitude) (Van Veldhoven and Meijman 1994; Van Veldhoven and Broersen 1999). The questions in the section health and well-being were derived from a study on psychological health by De Jonge et al. (2000), which used sources such as the Psychosomatic Complaints Scale (perceived health complaints) (Dirken 1969) and the Maslach Burnout Inventory (emotional exhaustion) (Schaufeli et al. 1996). No questions were asked about physical working circumstances (furnishings,

indoor climate, physical workload), because they were judged by systematic inspection. These data could not be linked to the questionnaire data.

At the request of the occupational health service (OHS), the well-being questionnaire was distributed among the employees in each unit. Employees could return the well-being questionnaire anonymously to the OHS in the envelope provided. When the questionnaires had been received, the answers to the questionnaires were entered optically per unit. If the response rate was less than 60-70%, the employees were reminded about the questionnaire by e-mail or during a staff meeting.

## Analyses

In order to check for selective non-response, we compared the sex and age of the respondents with these characteristics in the personnel database in the period corresponding with the well-being survey, using the  $\chi^2$ -test.

For each respondent, we calculated scores by adding the items in each scale and dividing by the number of items in that scale. Figure 1 shows the relationship between the work-related and personal characteristics and the health effects; the scales have been grouped into blocks. In the work-related characteristics, distinction was made between negative aspects (expected to have a negative influence) and positive aspects (a positive influence is expected). Working hours (i.e. part-time or full-time) could, in principle, be placed at various locations within the model. In our opinion it can best be placed under job control: it is a way of regulating the work pressure and is not per definition a positive or negative aspect of work. The personal characteristics sex and age were placed under 'capacity' (Van Dijk et al. 1990).

In the first phase of the analyses using stepwise linear regression analysis (De Vocht 1997) we investigated, per block, the correlation between each scale and the dependent variables 'early symptoms' and 'health effects'. If no significant correlation was found (i.e.  $p \geq 0.05$ ), the scale was removed from the analysis (data not presented). In the second phase, the blocks were added to the model in the order as follows: step 1 comprised stepwise linear regression analysis to investigate the correlation between the negative aspects of the work and the health effects. Step 2 also included the positive aspects. In step 3, job control was added, in step 4 social support and in step 5 personal characteristics, which represent capacity. Well-being at work was also included in the analyses with tension and emotional exhaustion as dependent variables. In the last phase, in the model with perceived health complaints, the three early symptoms were entered as independent variables. In order to detect whether health effects occurred in phases, we investigated the percentages of explained variance.

Stepwise linear regression analyses were performed on the following separate populations:

- Non-scientific personnel (NSP), i.e. administrative staff, analysts, technicians or others (not belonging to the scientific staff);
- Scientific personnel (SP), i.e. PhD students, (senior) university lecturers, professors and other scientific personnel.

Analyses were performed with the statistical program SPSS 9.0 for Windows.

## RESULTS

In total 2529 questionnaires were returned (response rate 54%); seven could not be used and were withdrawn from the analyses. Table 1 shows some personal characteristics of the respondents. Comparison with the personnel database showed selective non-response: relatively more women ( $\chi^2=8.09$ ;  $p=0.004$ ) and fewer persons younger than 25 years ( $\chi^2=57.53$ ;  $p<0.001$ ) returned the questionnaire.

**Table 1** Personal characteristics of the personnel in percentages.

Characteristics	Non-scientific (n = 1417)	Scientific (n = 1105)
<b>Sex</b>		
Male	49.3	69.5
Female	50.7	30.5
<b>Age</b>		
< 25 years	4.0	4.4
26-35 years	23.1	35.9
36-45 years	31.3	27.2
46-55 years	31.1	22.3
> 55 years	10.3	10.2
<b>Education level</b>		
Primary school/low secondary education	10.1	
Intermediate secondary education	26.0	
Higher secondary education	41.1	.4
University	22.8	99.6
<b>Job description</b>	40.7 Administrative	48.3 Faculty
	7.5 Analyst	22.6 PhD student
	16.2 Technical	29.1 Other
	35.6 Other	
<b>Part-time work</b>		
Yes	43.1	37.8
No	56.9	62.2

Table 2 shows means and ranges of the scales in the two populations. There were significant differences between the NSP and SP ( $t$ -test;  $p < 0.05$ ). The most relevant differences were found in professional expertise, well-being at work, autonomy, work variety and career opportunities. The SP always had a higher score than the NSP.

**Table 2** Overview of mean values and standard deviations (SD) in the well-being questionnaire.

Scale	Range	Mean (SD)		$t$ -value
		NSP* (n = 1417)	SP* (n = 1105)	
Unpleasant treatment <sup>+</sup>	1-4	1.08 (.20)	1.08 (.17)	ns
Role conflict <sup>+</sup>	1-4	1.66 (.45)	1.66 (.46)	ns
Work pressure <sup>+</sup>	1-5	3.11 (.74)	3.28 (.71)	-5.93
Role ambiguity <sup>+</sup>	1-4	1.92 (.58)	2.03 (.55)	-4.43
Employment terms <sup>#</sup>	1-5	3.37 (.69)	3.31 (.80)	2.22
Work variety <sup>#</sup>	1-5	3.18 (.75)	3.46 (.63)	-9.85
Information on work <sup>#</sup>	1-4	2.99 (.65)	3.16 (.59)	-6.44
Career opportunities <sup>#</sup>	1-5	2.51 (.84)	2.78 (.94)	-7.46
Communication <sup>#</sup>	1-4	2.74 (.70)	2.75 (.74)	ns
Professional expertise <sup>#</sup>	1-5	3.99 (.89)	4.45 (.63)	-14.92
Decision latitude <sup>#</sup>	1-4	2.62 (.62)	2.79 (.61)	-6.64
Autonomy <sup>#</sup>	1-5	3.37 (.79)	3.76 (.63)	-13.58
Social support from superiors <sup>#</sup>	1-4	3.24 (.67)	3.22 (.67)	ns
Social support from colleagues <sup>#</sup>	1-4	3.25 (.56)	3.26 (.51)	ns
Well-being at work <sup>#</sup>	1-5	3.67 (.78)	4.10 (.65)	-14.21
Tension <sup>+</sup>	1-4	1.79 (.68)	1.93 (.72)	-4.87
Emotional exhaustion <sup>+</sup>	1-5	1.81 (.72)	1.86 (.71)	ns
Perceived health complaints <sup>+</sup>	1-3	1.44 (.35)	1.35 (.30)	7.09

\*: NSP = Non-Scientific Personnel, SP = Scientific Personnel.

<sup>+</sup>: On these scales, a higher score is unfavourable.

<sup>#</sup>: On these scales, a higher score is favourable.

Tables 3 and 4 show the results of linear regression in the NSP and SP populations, respectively. In the scales from the block 'negative aspects of the work', we expected a negative correlation with the dependent variable well-being at work (in this case, a higher score on the independent scale would correlate with a lower score on well-being at work) and a positive correlation with the remaining dependent variables (a higher score on the independent scales would correlate with a higher score on tension, emotional exhaustion and perceived health complaints). In the scales from the block 'positive aspects of the work', 'job control' and 'social support', the opposite situation applied: we expected a positive correlation between these scales and well-being at work and a negative correlation with the other dependent variables. The tables only show the associations with a  $p$ -value of  $< 0.05$ .

In the first phase, working hours had a negative correlation with well-being at work (part-time work was associated with less well-being at work in the NSP) and emotional exhaustion (part-time work in the NSP and SP was associated with less emotional exhaustion), but in the later analyses, no significant correlation was found; results of the item working hours are therefore not presented. Only the results of well-being at work have been included in their entirety in the tables as an example. Not all results are presented for the other dependent variables.

### **Well-being at work**

Significant correlations were found between well-being at work and the positive aspects professional expertise, work variety and career opportunities: a higher score on these scales was associated with greater well-being at work. In addition, a strong correlation was found with the negative aspect role conflict. Contrary to our expectations, higher work pressure was associated with greater well-being at work. In the SP, this correlation was no longer significant after job control had been added. There was a difference between the NSP and SP regarding decision latitude: the correlation in the NSP was stronger than in the SP. In the SP, in contrast with the NSP, a significant but weak correlation was found for social support from superiors. After we had added the positive aspects in step 2, the correlations with the negative aspects became weaker. The percentage of explained variance was considerably larger in this step. Increases in explained variance in the subsequent steps were negligible. The percentages of explained variance in the last step were 54% and 41%, in the NSP and SP, respectively.

### **Tension**

The strongest correlations were found between the negative aspects work pressure or role conflicts and tension. The correlation with work pressure was stronger in the SP than in the NSP. In both populations, well-being at work was associated with less tension. This was also stronger in the SP than in the NSP. The positive effects and job control hardly played a role. Correlations with social support from superiors and colleagues were only significant in the NSP. The only positively correlated personal characteristic was age in the NSP: more advanced age was associated with greater tension. This step was not analysed in the SP, because no significant correlations were found earlier.

The negative aspects made the greatest contribution to the explained variance: in NSP and SP, the percentages of explained variance in the first step were 22% and 26%, respectively. In the last step, these rates were 25% and 30%, respectively.

**Table 3** Results from the stepwise linear regression analyses on non-scientific personnel (n = 1417).

	Well-being at work					Tension					Emotional exhaustion					Perceived health complaints						
Step	1	2	3	4	5	2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	7	
<i>Negative aspects<sup>+</sup></i>																						
Unpleasant treatment	β	β	β	β	β	β	β	β	β	β	β	β	β	β	β	β	β	β	β	β	β	
Role conflict	-	-	-	-	-	.10	.08	.08	.08	.08	.10	.09	.09	.07	.07	.20	.19	.15	.15	.15	.11	
Work pressure	-.27	-.11	-.11	-.11	-.12	.25	.19	.19	.19	.18	.19	.13	.13	.13	.11	.06	*	*	*	*	*	
Role ambiguity	.23	.10	.07	.08	.08	.15	.16	.15	.15	.17	.31	.31	.31	.32	.36	.14	.14	.13	.13	.13	*	
	-.20	-.09	-.07	-.07	-.06	.12	.06	.07	.07	.07	.06	*	*	*	*	-	-	-	-	-	-	
<i>Positive aspects<sup>#</sup></i>																						
Employment terms		.08	.05	.05	.06	-.07	*	*	*	*	-.11	-.09	-.09	-.09	-.07	-.08	-.07	-.08	-.08	-.08	*	
Work variety		.29	.25	.25	.25	-	-	-	-	-	-	-	-	-	-	-.13	-.13	-.12	-.12	-.12	-.09	
Information on work		.06	*	*	*	*	*	*	*	*	*	*	*	*	*	-	-	-	-	-	-	
Career opportunities		.13	.11	.11	.11	-	-	-	-	-	-	-	-	-	-	-.10	-.10	-.08	-.08	-.08	-.07	
Communication		.07	*	*	*	*	*	*	*	*	-.07	*	*	*	*	*	*	*	*	*	*	
Professional expertise		.32	.30	.30	.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<i>Job control<sup>#</sup></i>																						
Decision latitude		.21	.21	.21	.20	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Autonomy		*	*	*	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<i>Social support<sup>#</sup></i>																						
Support superiors		*	*	*	*	-.10	-.10	-.10	-.09	-.09	-.11	-.11	-.11	-.11	-.09	*	*	*	*	*	*	
Support colleagues		*	*	*	*	-.11	-.11	-.10	-.10	-.10	-.12	-.11	-.11	-.11	-.11	-.10	-.10	-.10	-.10	-.10	*	
<i>Capacity</i>																						
Sex					-		-		-	-	*	*	*	*	*			.16	.16	.16	.15	
Age					*		.06		.06	.06	-	-	-	-	-			.13	.13	.13	.13	
<i>Early signs</i>																						
Well-being at work					-.07										-.12	*	*	*	*	*	*	
Emotional exhaustion																					.31	
Tension																					.24	
R <sup>2</sup>	.16	.51	.53	.53	.54	.22	.24	.24	.25	.25	.31	.33	.33	.33	.34	.14	.15	.17	.17	.17	.33	

\*: Negative correlation with well-being at work: *higher* score on work-related scale was associated with *less* well-being at work. Positive correlation in the other columns: *higher* score on the work-related scales was associated with *more* tension, emotional exhaustion and perceived health complaints.

#: Positive correlation with well-being at work: *higher* score on work-related scale was associated with *more* well-being at work. Positive correlation in the other columns: *higher* score on the work-related scales was associated with *less* tension, emotional exhaustion and perceived health complaints.

-: This scale is not included on the basis of the first phase of the analyses; \*: This scale is included, but the correlation was not significant ( $p > 0.05$ ).

**Table 4** Results from the stepwise linear regression analyses on scientific personnel (n = 1105).

	Step	Well-being at work					Tension					Emotional exhaustion					Perceived health complaints						
		1	2	3	4	5	2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	7	
Negative aspects <sup>†</sup>																							
Unpleasant treatment	β	–	–	–	–	–	.12	.09	–	–	.10	.07	.05	–	–	.06	.14	.13	β	β	β	β	
Role conflict	–.30	–.14	–.14	–.12	–.12	–.12	.23	.18	–	–	.16	.12	.16	–	–	.14	.08	*	.08	.11	.11	.11	
Work pressure	.14	.06	*	*	*	*	.22	.24	–	–	.25	.32	.32	–	–	.34	.16	.16	.16	.16	.16	*	
Role ambiguity	–.27	–.12	–.10	–.08	–.08	–.08	.13	*	*	*	*	.12	.07	–	–	*	.07	*	*	*	*	*	
Positive aspects <sup>#</sup>																							
Employment terms	*	*	*	*	*	*	*	*	*	*	*	–.10	–.09	–	–	–.08	–.09	–.09	–.08	–.07	–.07	*	
Work variety	.26	.26	.24	.24	.24	.24	–	–	–	–	–	–	–	–	–	–	–.11	–.10	–.10	–.10	–.10	*	
Information on work	*	*	*	*	*	*	*	*	*	*	*	*	*	–	–	*	*	*	*	*	*	*	
Career opportunities	.17	.17	.16	.15	.15	.15	–.08	*	*	*	*	–	–	–	–	–	–.08	–.07	–.08	–.08	–.08	*	
Communication	.08	.08	*	*	*	*	*	*	*	*	*	–.08	*	–	–	*	–	–	–	–	–	–	
Professional expertise	.30	.30	.29	.29	.29	.29	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Job control <sup>#</sup>																							
Decision latitude																						*	
Autonomy	.11	.11	.09	.09	.09	.09	–.07	*	*	*	*	*	*	–	–	*	*	*	*	*	*	*	
Social support <sup>#</sup>																						*	
Support superiors																						*	
Support colleagues																						*	
Capacity																							
Sex																						.12	
Age																						*	
Early signs																							
Well-being at work																					*	*	
Emotional exhaustion																						.19	
Tension																						.31	
R <sup>2</sup>	.18	.40	.40	.40	.40	.40	.26	.28	.28	.28	.30	.35	.36	–	–	.38	.16	.16	.17	.17	.17	.29	

Explanation of symbols: see footnotes Table 3.

### **Emotional exhaustion**

Negative aspects chiefly explained emotional exhaustion. In both populations, the strongest correlation was with work pressure. In addition, well-being at work played a role: a higher score was associated with less emotional exhaustion. In the NSP, significant correlations were found with support from superiors and colleagues. The positive aspects and job control hardly played a role. In the first phase of the analyses, none of the personal characteristics in the SP played a role; therefore, step 5 was not carried out. In the NSP, only sex was added, but it had no significant influence in the second phase.

As was the case with tension, the negative aspects in step 1 made the greatest contribution to the explained variance in emotional exhaustion: in the NSP and SP, 30% and 33%, respectively. In the last step, these rates were 34% and 38%.

### **Perceived health complaints**

In the last step, particularly tension and emotional exhaustion contributed to explaining perceived health complaints. In the SP, the correlation with tension was stronger; in the NSP this applied to emotional exhaustion. In addition, sex played a marked role: women reported more perceived health complaints than men. In the NSP, more advanced age was associated with more perceived health complaints. The only negative aspect with a significant correlation was unpleasant treatment/discrimination; this was slightly stronger in the NSP than in the SP. The positive aspects employment terms, work variety and career opportunities played a significant role. In the scales under job control and social support, there was a significant correlation only for support from colleagues. The majority of these correlations were no longer significant after we had added tension and emotional exhaustion to the model.

Variance was chiefly explained by the negative aspects, personal characteristics, tension and emotional exhaustion. In step 1, the percentages of explained variance in the NSP and SP were 10% and 13%, respectively. These rates were 17% and 17% in step 5 and 33% and 29% in step 7, respectively. The personal characteristics in the NSP made a much larger contribution to the explained variance than in the SP.

## **DISCUSSION**

In this study, we investigated which factors contributed to explaining health effects. In general, well-being at work could be explained by the positive work aspects, especially professional expertise and work variety. Tension could be explained by the negative aspects. Similarly, the negative aspects were the most important factors behind emotional exhaustion; especially work pressure played a strong role. In the case of



perceived health complaints, not only the negative aspects, but also sex, age, tension and emotional exhaustion made a large contribution to the explained variance. In literature, it is reported that high work demands, low job control and low social support are the most important risk factors (Karasek 1979; Johnson and Hall 1988; Kompier and Marcelissen 1990; De Jonge and Furda 1995; Kompier and Houtman 1995; De Jonge et al. 1996; Houtman et al. 2000; Van der Doef 2000). However, this study showed that particularly high work demands had a strong influence. There were no obvious indications in the present population that improvement in job control and/or social support would have contributed to decreasing the negative health effects.

### **Differences between SP and NSP**

We investigated where differences occurred between the SP and NSP. In view of the large number of respondents, many of the differences found were statistically significant (Table 2), but not all were relevant (Sonke and Rovers 2001). The most important differences were found in professional expertise, well-being at work, autonomy, work variety and career opportunities. In all cases, the SP had more favourable scores than the NSP.

Linear regression analyses showed only a few differences between the NSP and SP. In the NSP, the explained variance of well-being at work by the positive aspects of the work was considerably higher than in the SP. Moreover, the association with job control was higher in the NSP than in the SP.

Social support from superiors and colleagues in the NSP contributed to the explanation of tension and emotional exhaustion, but not in the SP. However, there was no difference in reported social support between the two populations (Table 2). Even when the items within a scale were evaluated separately, no appreciable differences were ascertained. The existence of an association with social support in the NSP perhaps indicates that the need for, and experience of, social support in the NSP was different from that in the SP. It is possible that the most relevant aspects of social support for the SP were not mapped sufficiently by the questions we asked, because they were derived from the Questionnaire Organisation Stress (VOS-D) (Bergers et al. 1986), which was developed for people with jobs at a lower education level.

In the first phase of the analyses on the SP, each dependent variable was significantly correlated with autonomy (Table 4). In the NSP, this was only found for well-being at work (Table 3). It was striking that in the second phase, no significant correlations were found. The same scale was applied in a study on nurses and auxiliaries, where a mean score of 2.81 (SD: 0.61) was found (De Jonge et al. 1995). In comparison, the level of autonomy within the university was extremely high, both in the NSP (mean: 3.37; SD: 0.79) and in the SP (3.76; SD: 0.63). It is possible that these values were

so favourable that autonomy no longer played a role. On the other hand, it is possible that there was an inverse correlation, such as that described in the Vitamin model proposed by Warr (1990). For autonomy, just like for vitamins A and D, it is not always true that 'the more the better'; an increased 'dose' can even have negative effects (Warr 1990; Zijlstra et al. 2000). Van Veldhoven et al. (1999) also concluded that high job control is not per definition favourable, but that it is more important to adapt the level of control to the work demands. Table 2 confirms that this may be the case: the SP not only had higher scores for aspects, such as autonomy and decision latitude, but also for tension. Our analyses showed that in both the SP and NSP, decision latitude was not correlated with perceived health complaints. According to Vaas (1995), the influence of decision latitude is chiefly concerned with psychological health. In both populations, a correlation was found between well-being at work and decision latitude. This applied to a lesser extent to the SP for emotional exhaustion and tension. These dependent variables lie more closely to psychological health than perceived health complaints.

In this study, the number of working hours (e.g. part-time, full-time) did not play any clear role in explaining the health effects. However, the question only distinguished between part-time and not part-time. It was not possible to distinguish between a working week of two or four days, although this may have been important.

The differences between the NSP and SP were smaller than we expected. The large number of highly educated persons within the NSP might explain this: almost one quarter had university degree (Table 1). A proportion of the NSP held high positions with similar levels of challenge and autonomy as those of the SP. Further analyses (ANOVA,  $p < 0.05$ ) showed that NSP employees with a university degree were more comparable with the SP on aspects, such as work variety, work pressure, role ambiguity, decision latitude and perceived health complaints, than the remaining NSP employees. On the scales professional expertise, information, career opportunities and tension, there were more similarities with the remaining NSP employees. Mean values of autonomy and well-being at work lay between those of the remaining NSP employees and SP. Differences were also found within the SP: senior university lecturers and professors had more favourable scores on scales, such as work variety, communication and decision latitude, but less favourable scores of work pressure. PhD students had more favourable scores on the scales autonomy and career opportunities. Possibly, the contrast would have been sharper if we had paid closer attention to the diversity within the personnel categories. Another explanation may be that the measurement-technical precision in the high scores was not optimal in the scales we used. There may have been ceiling effects: in the case of high scores, the scale did not differentiate sufficiently, or there was too little variance (Streiner and Norman 1989).

### **Phased occurrence of health effects**

In this study, we assumed that health effects occurred in phases. To evaluate whether distinctions could be made between health effects, the proportions of explained variance were calculated: in well-being at work it was higher than in perceived health complaints. Emotional exhaustion and tension lay in between. Van der Doef (2000) reported similar findings: in her study, the highest explained variance was found for job dissatisfaction, while the lowest was found for (psycho)somatic complaints. In our study, the percentages of explained variance of perceived health complaints were 33% and 29% in the NSP and SP, respectively. These rates were fairly high, especially when we consider that this type of complaints can be explained not only by work-related characteristics, but also by factors outside work. The percentages can be expected to increase even further if factors outside work are also included as independent variables.

### **Personal characteristics**

Sex only showed a significant correlation with perceived health complaints: women reported more complaints than men. Differences in health complaints between men and women cannot simply be explained by biological factors (Kolk et al. 1999). Frequently, they concern 'vague' physical complaints, in which physiological, social, cognitive and emotional factors play a role. Women distinguish themselves from men on the grounds of more physical sensations and complaints owing to the hormonal cycle, pregnancy and menopause (Gijsbers van Wijk and Kolk 1997; Kolk and Gijsbers van Wijk 1997; Kolk et al. 1999). However, these differences form insufficient explanation. With respect to the social position, persons who fulfil multiple roles (e.g. work and family responsibilities) consequently receive more external stimuli. In general, these persons pay less attention to physical signs, report fewer complaints and feel healthier than persons with a single role (Gijsbers van Wijk et al. 1991; Gijsbers van Wijk and Kolk 1997; Kolk and Gijsbers van Wijk 1997). However, working women often have part-time jobs and less demanding work. Consequently, they receive fewer external stimuli than persons with full-time jobs and/or persons whose work is more varied and challenging. Thus, they may have more time to take note of vague physical signals (Gijsbers van Wijk et al. 1991; Gijsbers van Wijk and Kolk 1997; Kolk and Gijsbers van Wijk 1997). On the other hand, working women may suffer from more complaints that result from over-burdening than men, owing to the combination of outside employment and taking care of a family (a second reason to incorporate burdens outside work into further research) (Kolk et al. 1995; Kolk and Gijsbers van Wijk 1997). Furthermore, women are more strongly oriented towards internal, physical sensations and are more likely to attribute them to illness. Explanations for this can be

found in the up-bringing (boys are taught to ignore physical sensations) and in the role in the family: women often pay attention to symptoms in their children and partner, which gives them greater awareness and knowledge of (ill) health (Gijsbers van Wijk et al. 1991; Gijsbers van Wijk and Kolk 1997; Kolk and Gijsbers van Wijk 1997).

Age played a role only in the NSP: older employees in this group reported more tension and more perceived health complaints. A possible explanation for the lack of other associations between age and for instance well-being at work is, that every age group has some specific work characteristics, which leads to a masking of effects (Griffiths 2000). Younger workers' concerns about their work appear more immediate and focused on task content. Older workers may experience problems with contextual issues, e.g. lack of recognition, devaluing behaviours of supervisors and colleagues, and disappointment with management (Griffiths 2000).

## **Methodology**

Work-related characteristics, personal characteristics and health effects were assessed by means of a questionnaire. We used existing validated scales as much as possible to construct our questionnaire. The internal consistency of the scales used in the development of our questionnaire was generally moderate to good (De Jonge et al. 1995). In addition, we tried to take into consideration the type of work carried out at a university. Van der Doef (2000) is one of the authors who described the necessity of using job-specific measuring instruments to obtain the most adequate possible overview of the work situation. Until now, this has received relatively little attention. This may be due to the time investment required to develop many good questionnaires, or because it is difficult to compare studies on different professions when job-specific questionnaires have been used.

The response rate of 54% is satisfactory and we do not expect major effects of selection bias. Representativeness is especially important in descriptive studies. However, in analytical studies such as ours it is the variation of exposure that matters to find proper associations (Kristensen 1995). Comparison of the personal characteristics sex and age of the respondents with the personnel database showed that more women and fewer employees of younger than 25 years had returned the questionnaire. This can partly be explained by the assumed low response among student-assistants. These employees hold such small jobs, that they probably considered themselves as not representative to participate in the study. In addition, we attempted to assess the issue of selective non-response according to job description, but in the personnel database, a classification had been used that was not comparable with the manner in which job description was addressed in the questionnaire.

A limitation of this study was the cross-sectional design. It was assumed that work-related characteristics led to health effects, but as they were measured simultaneously, it was not possible for us to draw conclusions about causality or the direction of the correlations found. An illustration of this was the positive correlation between work pressure and well-being at work: it is probable that close involvement and challenges in the work (aspects of well-being at work) led to higher work pressure instead of the other way around. In addition, it is also possible that tension, emotional exhaustion and perceived health complaints influenced the perception of work-related characteristics (De Jonge and Furda 1995; De Jonge et al. 1996).

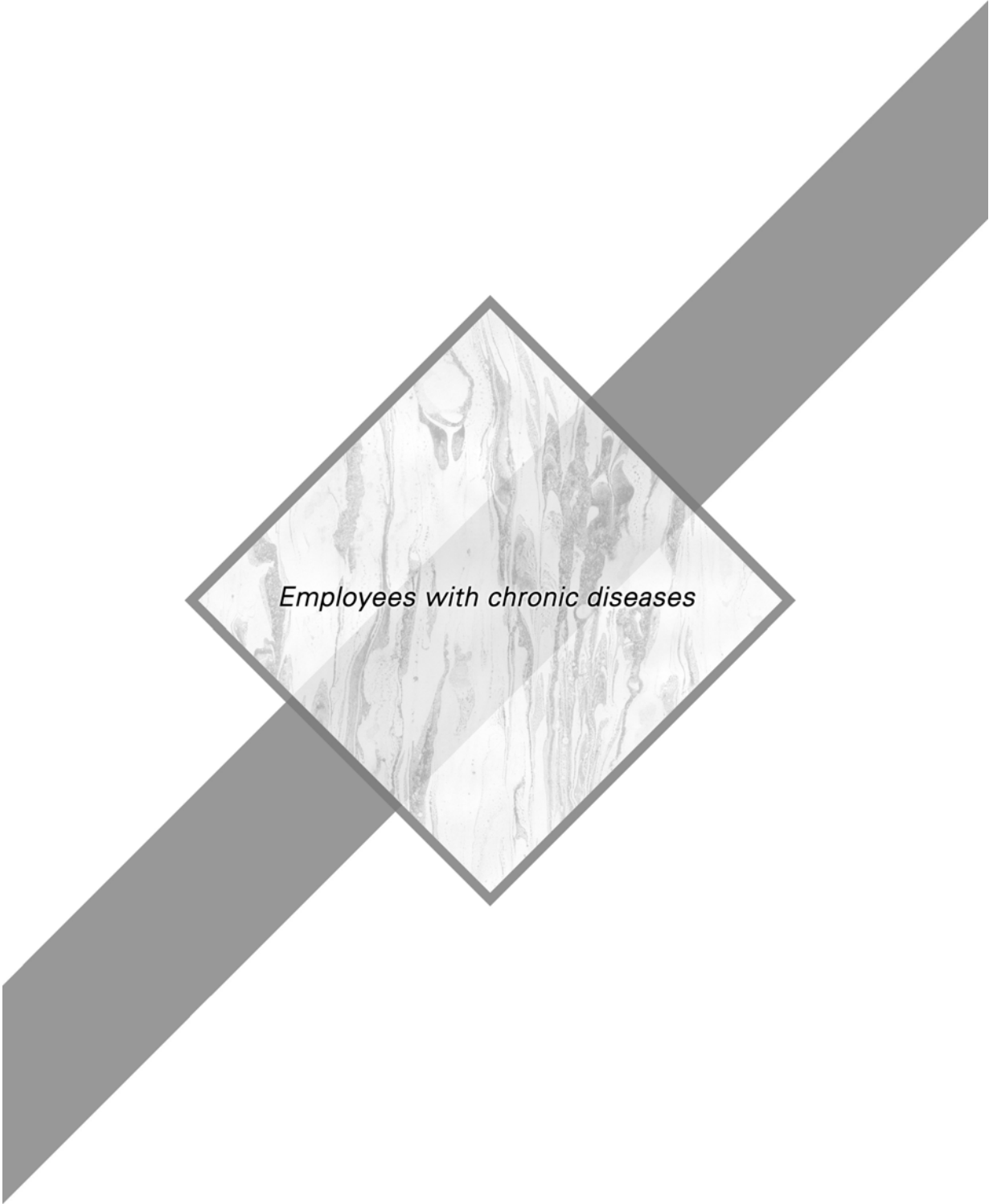
## CONCLUSIONS

From this study, it can be concluded that improving job control and social support will not always contribute to preventing health effects. The negative work aspects, such as work pressure and role conflict also require attention. This applies to both non-scientific and scientific personnel. In addition, it can be concluded that it is plausible that health effects occur in phases: in the model, earlier (health) symptoms (well-being at work) seemed to precede health effects (perceived health complaints).

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*Employees with chronic diseases*







**Health-related and work-related aspects associated with sick leave:  
a comparison of chronically ill and non-chronically ill workers**

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## ABSTRACT

**Objectives:** Our aims were to study to what extent chronically ill workers (CIWs) take more sick leave than non-chronically ill workers (NCIW) and to explore which health-related and work-related aspects are associated with the sick leave patterns of the two groups.

**Methods:** A questionnaire on psychosocial workload, health and sick leave was sent to all employees of a university in the Netherlands (response: 49.1%). Analyses were conducted on 444 CIWs and 1347 NCIW. Odds ratios (OR) were calculated to quantify the contribution of being chronically ill to sick leave in general, frequent sick leave, prolonged sick leave and present sick leave. The contributions of health-related and work-related aspects to sick leave were investigated by multiple logistic regression analyses, on the CIWs and NCIW separately. **Results:** The CIWs showed significantly increased ORs for general, frequent, prolonged and present sick leave when compared with the NCIW. Fatigue, emotional exhaustion and perceived health complaints showed stronger associations with sick leave in both the CIWs and NCIW than various work-related aspects. Workers of 46 years of age and older showed less sick leave than workers under the age of 36. Male respondents and scientific personnel showed less frequent sick leave than the other respondents and so did respondents working more than 40 hours a week, compared with part-timers. The final regression models explained 8%-16% of the variance in sick leave. **Conclusions:** CIWs take 2-3 times more and longer sick leave than NCIW. Health-related aspects are more strongly associated with sick leave than work-related aspects in both the CIWs and NCIW. Sick leave patterns were, nevertheless, only partly explained by health-related and work-related aspects. In any case, future studies of sick leave should certainly take the presence of chronic disease into account as an important determinant of sick leave.

**Keywords:** sick leave, chronic disease, psychosocial workload

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## INTRODUCTION

In search of the determinants of sick leave, several studies have examined the contributions of various work-related aspects. Little attention has been paid to the contribution of health-related aspects and the presence of chronic disease in particular, even though the prevalence of chronic disease in the western world is high. In 2001, 23% of the Dutch population between 15-64 years of age reported suffering from a chronic disease in the past 12 months (CBS 2001). Given a chronic disease, many people are not able to hold a paid job and may experience problems with finding and keeping a job (Smulders and op de Weegh 1995; Van de Mheen et al. 1999; CBS 2001). When employed, moreover, the chronically ill tend to take more sick leave than their colleagues (Kessler et al. 2001). Such a difference has been found for workers with diabetes (Waclawski 1990; Poole et al. 1994; Mayfield et al. 1999; Skerjanc 2001), psychiatric disorders (Jenkins 1985; Hensing and Spak 1998) and respiratory diseases (Alexopoulos and Burdorf 2001). This is not only because of the specific impairments of the chronic disease itself: various, non-specific, health-related aspects also seem to play a role in the occurrence of sick leave. Among those suffering from a chronic disease, general health complaints and, particularly, fatigue are associated with more frequent and prolonged sick leave (Kessler et al. 2001; Baanders et al. 2002).

In addition to health-related aspects, work-related aspects may contribute to the relatively higher prevalence of sick leave among the chronically ill. For instance, Detaille et al. (2003) and Boot (2004) have shown work-related aspects, such as high autonomy, flexible working hours, adaptations in the workplace, social support from colleagues and superiors and good communication to be associated with the continuation of work by employees with rheumatoid arthritis, diabetes mellitus and hearing loss (Detaille et al. 2003) and with less sick leave in workers with asthma and COPD (Boot 2004). The work-related aspects contributing to the occurrence of sick leave among the chronically ill may be different from the work-related aspects contributing to the occurrence of sick leave among workers in good health. It is, therefore, important to search for and compare the work-related aspects associated with sick leave among chronically ill workers and their non-chronically ill colleagues. Greater knowledge of the associations between health status, work-related aspects and sick leave is also relevant for sick leave prevention in general, for pre-employment and pre-assignment examinations, and the counselling of chronically ill workers in particular. In the present cross-sectional study, we therefore investigated to what extent chronically ill workers (CIWs) actually show more frequent and more prolonged sick leave than non-chronically ill workers (NCIW). We then explored which health-related and work-related aspects appear to be associated with the sick leave measures in the CIWs and NCIW, and whether there are different patterns of associations

between these two groups. To our knowledge, no previous study has been conducted on the combined effects of health-related and work-related aspects on the patterns of sick leave among chronically ill workers and their non-chronically ill colleagues.

## **METHODS**

### **Data collection**

The data for the present study were obtained via a questionnaire mailed to the home addresses of all workers at a Dutch university. The respondents were informed of the objectives of the study and assured that their responses would be handled with confidentiality. After three weeks, all the workers were sent a reminder. Both the University Board and Works Council of the university approved the study. The questionnaire included questions regarding sex, age, employment function, education level and hours worked weekly, which have been mentioned as potential confounders in the literature (Van de Mheen et al. 1999; McDonough and Walters 2001; Kessler et al. 2001; Molarius and Janson 2002), chronic disease, health-related aspects, work-related aspects and sick leave. The data were collected in 2001.

### *Chronic disease*

When the respondents were asked 'Do you have a chronic disease?', the following response options were possible: no, diabetes, psychological condition (depression, anxiety, addiction), cancer, cardiovascular disease, respiratory disease (asthma, bronchitis, COPD), neurological disease (Parkinson's, multiple sclerosis, et cetera), musculoskeletal complaints (rheumatic arthritis, osteo-arthritis, et cetera) and 'other, namely...'. These options correspond to the chronic diseases most prevalent in the Netherlands (Van den Bosch et al. 2000). Those respondents who provided a positive answer on one or more of these chronic diseases were categorised as chronically ill workers (CIWs). Those respondents who marked the option 'other, namely...' were also considered chronically ill when their disease fell within one of the following, newly formed, categories: skin disease or gastro-intestinal disease. After this, the remaining respondents were individually considered and categorised as CIWs when indeed found to have a disease in the category 'other, namely...'. Those respondents who reported such minor complaints (e.g. often having a cold) that they could not be assumed to have some other chronic disease, or who simply did not answer the question on chronic disease were excluded from the analyses ( $n = 52$ ). All of the other respondents were categorised as non-chronically ill workers (NCIW).

*Health-related aspects*

Fatigue (four items) was assessed with the Shortened Fatigue Questionnaire (Alberts et al. 1997; Boot 2004). Emotional exhaustion (four items) was measured with the Dutch version of the Maslach Burnout Inventory (De Jonge et al. 2000). Perceived health complaints (13 items) were measured with the VOG-13 that includes 13 dichotomous items to assess whether a person occasionally suffers from a range of psychosomatic complaints (Dirken 1969; Geurts et al. 1999).

*Work-related aspects*

Work-related aspects were assessed using various parts of previously validated questionnaires. Work variety (three items) and professional expertise (three items) were measured with the Maastricht Risk Assessment Questionnaire (De Jonge et al. 2000). Work pressure (eight items) and autonomy (ten items) were measured with the Maastricht Autonomy Questionnaire (De Jonge et al. 1995). Role conflict (five items), role ambiguity (five items), social support from superiors (five items) and social support from colleagues (five items) were measured with the Questionnaire Organizational Stress-D (Bergers et al. 1986). Information on work (three items), communication (four items), possibilities for learning (four items), decision latitude (nine items) and physical workload (three items) were assessed with the Questionnaire on Experience and Evaluation of Work (Van Veldhoven and Meijman 1994; Van Veldhoven and Broersen 1999). Career opportunities (three items), employment terms (five items) and well-being at work (three items) were also measured (De Jonge et al. 2000; Donders et al. 2003).

*Sick leave due to health problems*

The dichotomous variable general sick leave was based on the question 'Have you ever taken sick leave because of health problems in the past 12 months?' (yes or no). Present sick leave was based on the question 'Are you on sick leave at this moment?' (yes or no). Open questions were posed with regard to the frequency and duration (in weeks) of any sick leave during the past 12 months. Owing to our interest in primarily sick leave due to health problems, sick leave due to pregnancy ( $n=16$ ) or accidents / sport injuries ( $n=19$ ) was categorised as no sick leave. Frequent sick leave was defined as more than two episodes of sick leave during the past 12 months, regardless of duration. Prolonged sick leave was defined as more than two weeks of sick leave during the past 12 months (sum of the duration of all episodes of sick leave).

### *Demographic characteristics*

Sex was coded as 0 = male and 1 = female. Subjects were categorised into four age groups: <36 years, 36-45 years, 46-55 years and >55 years. Education level was categorised into three levels: primary school/lower vocational, secondary school/higher vocational or university. Employment function was categorised into three levels based on a combination of education level and job title: lower-educated non-scientific personnel (low NSP), higher-educated non-scientific personnel (high NSP) and scientific personnel (SP). The total number of hours worked weekly (all jobs, including overtime) was categorised into three groups: <25 hours, 25-40 hours and >40 hours.

### **Analyses**

The small number of respondents with missing data (mean percentage: 1.7%) on health-related and/or work-related items were assigned the mean item score for the corresponding category of employment function. For every respondent, the item scores on fatigue and perceived health complaints were summed. The mean item scores for emotional exhaustion and for all the work-related aspects were calculated. Cronbach's alphas for each of the health-related and work-related aspects were calculated. A Cronbach's alpha of 0.70 or higher was taken to reflect good internal consistency (Nunnally 1978). For the health-related aspects, the Cronbach's alphas were high (>0.75). Most of the work-related aspects also had high Cronbach's alphas (>0.70), with the exception of work variety (0.67), career opportunities (0.68) and employment terms (0.63).

### *Differences between CIWs and NCIWs*

The demographic characteristics in the CIWs and NCIWs were compared using  $\chi^2$ -test. The percentages of sick leave in the CIWs and NCIWs were compared and the calculated odds ratios (ORs) were adjusted for sex, age, employment function and hours worked weekly. The mean scores of the CIWs and NCIWs on the various health-related and work-related aspects were compared using General Linear Model (GLM). Sex, age, employment function and hours worked weekly were included as fixed factors in order to adjust for potential confounding influences. For all the tests, the significance level was set at  $p \leq 0.05$ .

### *Univariate analyses*

Present sick leave was not further investigated, due to the small number of respondents reporting such ( $n=102$ ). For the logistic regression analyses, health-related and work-related aspects were dichotomised at the 66 percentile into low versus high scores. Univariate logistic regression analyses were performed to study the

associations between each of the health-related and work-related aspects and the various sick leave variables (general, frequent and prolonged sick leave). P-values  $<0.10$  were used to select significant associations, and these relevant health-related and work-related aspects were then entered into the multivariate analyses.

### *Multivariate analyses*

We used logistic regression models to analyse the CIWs and NCIWs separately. Based on the results of the univariate analyses, four blocks of variables were formed: 1) health-related aspects; 2) work-related aspects; 3) demographic characteristics; 4) hours worked weekly.

The analyses were first conducted using backward stepwise logistic regression with 0.10 as the exit criterion for each block separately. For each block, the Nagelkerke  $R^2$  was calculated; this measure can be interpreted as an estimate of the percentage explained variance in occurrence of sick leave (Nagelkerke 1991). The remaining variables for each block were next analysed in a final logistic regression model with a 0.05 exit criterion. The strongest aspects associated with sick leave were identified on the basis of ORs with a 95% confidence interval. This procedure was followed in the CIWs and NCIWs separately and for the various sick leave variables separately. We also calculated the Nagelkerke  $R^2$  for the final models, to estimate the total percentage of explained variance (Nagelkerke 1991). All of the analyses were conducted with the statistical program SPSS 11.0.

## **RESULTS**

### **Response rate and characteristics of the population**

A total of 3881 questionnaires was distributed and 1843 were returned, yielding a crude response rate of 47.5%. However, 16 people indicated the receipt of two questionnaires because they had more than one job at the university; 41 questionnaires were returned as undeliverable; and 73 individuals were no longer employed at the university anymore. The adjusted response rate was 49.1%. The data were compared with a personnel database, which revealed that fewer men than women responded ( $\chi^2 = 71.8$ ,  $p < 0.001$ ). Analyses were performed with 444 CIWs (24.8%) and 1347 NCIWs (75.2%).

The distribution of chronic disease among the CIWs was as follows: musculoskeletal complaints (33.3%); respiratory diseases (22.1%); psychological conditions (11.7%); cardiovascular diseases (10.1%); diabetes (6.1%); cancer (4.3%); neurological diseases (3.6%); gastro-intestinal diseases (3.2%); skin diseases (3.2%) and other

(e.g. allergies, migraine, diseases of the thyroid gland, et cetera) (19.4%). Comorbidity occurred in 13.3% of the CIWs.

Comparison of the CIWs with the NCIWs revealed significant differences for age, education level, employment function and hours worked weekly, but not for sex (Table 1). CIWs were, on average, older than the NCIWs. A higher percentage of CIWs also had a lower level of education and more of them were categorised as lower-educated non-scientific function than the NCIWs. Finally, fewer of the CIWs worked >40 hours a week and more of them worked <25 hours a week compared to NCIWs.

**Table 1** Demographic characteristics of population in percentages.

	CIWs*		NCIWs*		$\chi^2$ -test
	n	%	n	%	p-value
<b>Sex</b>					.27
Male	224	50.8	724	53.8	
Female	217	49.2	621	46.2	
<b>Age</b>					<.01
< 36	104	24.1	478	36.0	
36-45	107	24.8	372	28.8	
46-55	142	32.9	340	25.6	
> 55	79	18.3	137	10.3	
<b>Education level</b>					<.01
Primary school / lower vocational	68	15.4	96	7.1	
Secondary / higher vocational	149	33.8	407	30.3	
University	224	50.8	842	62.6	
<b>Employment function</b>					<.01
Lower-educated non-scientific personnel (low NSP)	141	32.0	331	24.6	
Higher-educated non-scientific personnel (high NSP)	128	29.0	337	28.1	
Scientific personnel (SP)	172	39.0	635	47.3	
<b>Hours worked weekly</b>					<.01
< 25 hours	88	19.9	182	13.6	
25-40 hours	227	51.2	694	52.0	
> 40 hours	128	28.9	458	34.3	

\*: CIWs = chronically ill workers, NCIWs = non-chronically ill workers.

### Sick leave and scores of health-related and work-related aspects

The results of the analyses performed for each of the sick leave variables separately showed the CIWs to take significantly more sick leave than the NCIWs (Table 2). The CIWs showed frequent sick leave approximately twice as often as the NCIWs (16% vs. 9%) and also reported more prolonged sick leave (26% vs. 11%). At the time of questionnaire completion, approximately 10% of the CIWs and 4% of the NCIWs were on sick leave.



**Table 2** Odds ratios (OR) and 95% confidence interval (CI) for sick leave.

<b>Sick leave</b>	<b>Definition</b>	<b>CIWs* % (n)</b>	<b>NCIW* % (n)</b>	<b>OR<sup>†</sup></b>	<b>95% CI</b>
General sick leave	during the last 12 months	69.5 (443)	54.9 (1346)	2.0	1.6 - 2.6
Frequent sick leave	more than 2 episodes during the last 12 months	16.1 (386)	8.9 (1254)	2.1	1.5 - 2.9
Prolonged sick leave	more than a total of 2 weeks during the last 12 months	26.3 (418)	11.1 (1327)	2.7	2.1 - 3.7
Present sick leave	at moment of questionnaire completion	10.2 (442)	4.2 (1341)	2.6	1.7 - 3.9

\*: CIWs = chronically ill workers, NCIWs = non-chronically ill workers.

†: The odds ratios are adjusted for sex, age, employment function and hours worked weekly.

An overview of the mean scores for the various health-related and work-related aspects showed that the CIWs reported more perceived health complaints and higher levels of fatigue and emotional exhaustion than the NCIWs (Table 3). The CIWs also produced significantly lower scores than the NCIWs on nearly all the positive work-related aspects, with particularly low scores for social support from superiors and colleagues, decision latitude and career opportunities. For the negative work-related aspects, the CIWs scored significantly higher than the NCIWs on physical workload and role conflicts.

### Aspects associated with sick leave in CIWs and NCIWs

Regression analyses the four blocks of variables resulted in explanations of the variance in the various sick leave scores (Table 4). Health-related aspects contributed by far the most to the proportion of explained variance for each of the sick leave variables. Work-related aspects generally explained little compared to the health-related aspects, with the exception of the explanation of prolonged sick leave in the NCIWs.

**Table 3** Mean scores and standard deviations (SD) for health-related and work-related aspects (adjusted for sex, age, employment function and hours worked weekly).

	Nr of items	Range*	Mean (SD)		GLM
			CIWs <sup>+</sup> (n = 428)	NCIW <sup>+</sup> s <sup>+</sup> (n = 1321)	p-value
<i>Health-related aspects<sup>#</sup></i>					
Fatigue	7	4 – 28	14.47 (6.78)	11.64 (7.85)	<.001
Emotional exhaustion	4	1 – 5	2.63 (.99)	2.40 (1.14)	<.001
Perceived health complaints	13	0 – 13	3.88 (2.57)	2.34 (2.98)	<.001
<i>Negative work-related aspects<sup>#</sup></i>					
Role conflict	5	1 – 4	1.70 (.45)	1.63 (.52)	.008
Work pressure	8	1 – 5	3.10 (.72)	3.05 (.84)	.220
Role ambiguity	5	1 – 4	2.03 (.61)	1.97 (.71)	.048
Physical workload	3	1 – 4	1.70 (.58)	1.53 (.67)	<.001
<i>Positive work-related aspects<sup>+</sup></i>					
Employment terms	5	1 – 5	3.58 (.87)	3.45 (.75)	.001
Work variety	3	1 – 5	3.17 (.67)	3.25 (.78)	.033
Information on work	3	1 – 4	2.93 (.68)	3.01 (.72)	.021
Career opportunities	3	1 – 5	2.49 (.94)	2.64 (1.09)	.002
Communication	4	1 – 4	2.63 (.69)	2.73 (.80)	.012
Professional expertise	2	1 – 5	4.03 (.79)	4.07 (.82)	.388
Possibilities for learning	4	1 – 4	2.76 (.65)	2.85 (.76)	.009
Decision latitude	11	1 – 4	2.59 (.61)	2.69 (.71)	.002
Autonomy	8	1 – 5	3.45 (.70)	3.52 (.74)	.060
Social support from superiors	5	1 – 4	3.14 (.68)	3.28 (.79)	<.001
Social support from colleagues	5	1 – 4	3.17 (.56)	3.29 (.65)	<.001
Well-being at work	3	1 – 5	3.81 (.76)	3.90 (.88)	.027

\*: 'Fatigue' and 'perceived health complaints' are sum scores, all other scales are mean item scores.

†: CIWs = chronically ill workers, NCIWs = non-chronically ill workers.

#: A high score is assumed to be associated with more sick leave.

†: A high score is assumed to be associated with less sick leave.

Demographic characteristics and hours worked weekly explained only a minor proportion of the variance in sick leave, with the exception of frequent sick leave in the CIWs. In the final models (Table 5), health-related aspects were associated with every sick leave variable in both the CIWs and NCIWs. The ORs for the health-related aspects were also higher than for the work-related aspects in all models. Significant contributions of sex, age, employment function and hours worked weekly were found as well, in both CIWs and NCIWs. The final models for the NCIWs contained more variables than the final models for the CIWs primarily because the former included more work-related aspects than the latter. The percentages of explained variance ranged from 8% to 16% for all the models.

**Table 4** Percentages explained variance in sick leave in the CIWs and NCIWs (estimated by Nagelkerke  $R^2$ ) of the separate blocks and the final model.

Sick leave	Blocks	Percentages explained variance	
		CIWs*	NCIW*
General sick leave	1 Health-related aspects	6.1	4.2
	2 Work-related aspects	3.2	2.5
	3 Demographics	2.0	2.2
	4 Hours worked weekly	-	1.7
	<b>1 + 2 + 3 + 4 (final model)</b>	<b>7.8</b>	<b>8.0</b>
Frequent sick leave	1 Health-related aspects	8.4	8.9
	2 Work-related aspects	2.3	2.2
	3 Demographics	6.3	3.0
	4 Hours worked weekly	2.5	-
	<b>1 + 2 + 3 + 4 (final model)</b>	<b>14.8</b>	<b>11.8</b>
Prolonged sick leave	1 Health-related aspects	8.1	9.2
	2 Work-related aspects	3.5	8.7
	3 Demographics	3.0	2.8
	4 Hours worked weekly	2.1	2.6
	<b>1 + 2 + 3 + 4 (final model)</b>	<b>9.7</b>	<b>15.6</b>

\*: CIWs = chronically ill workers, NCIWs = non-chronically ill workers.

### *Chronically ill workers*

In the CIWs, the variable general sick leave was associated with health-related aspects and female sex. Frequent sick leave was partly explained by fatigue. In addition, workers of 46-55 years of age showed less frequent sick leave than workers less than 36 years of age. Those who worked more than 40 hours a week showed less frequent sick leave than respondents who worked less than 24 hours a week. Prolonged sick leave was associated with perceived health complaints; workers with a high score on professional expertise showed less prolonged sick leave, however.

### *Non-chronically ill workers*

As already noted, work-related aspects, in addition to health-related aspects were found to explain part of the variance in sick leave in the NCIWs. Any sick leave was associated with fatigue, perceived health complaints and physical workload. In addition, workers older than 55 years of age showed less sick leave relative to workers younger than 36 years of age. Working more than 40 hours a week and good possibilities for learning also was associated with less sick leave.

**Table 5** Final model of aspects associated with sick leave in chronically ill workers (CIWs) and non-chronically ill workers (NCIW's).

Sick leave	CIWs	OR	95% CI	% variance explained	NCIW's	OR	95% CI	% variance explained
General sick leave								
				7.8				8.0
	Perceived health complaints	1.8	1.1 – 2.9		Fatigue	1.7	1.3 – 2.3	
	Emotional exhaustion	1.8	1.0 – 3.1		Perceived health complaints	1.5	1.1 – 2.0	
	Female sex	1.6	1.1 – 2.5		Possibilities for learning	0.8	0.6 – 1.0	
					Physical workload	1.4	1.0 – 1.8	
					Age >55 yrs vs. age <36 yrs	0.7	0.4 – 1.0	
					>40 hrs vs. <25 hrs	0.7	0.5 – 1.0	
Frequent sick leave								
				14.8				11.3
	Fatigue	3.8	2.1 – 6.8		Perceived health complaints	2.7	1.7 – 4.3	
	Age 46-55 yrs vs. age <36 yrs	0.4	0.2 – 0.9		Emotional exhaustion	2.4	1.5 – 3.9	
	>40 hrs vs. <25 hrs	0.3	0.1 – 0.8		Low NSP vs. SP*	1.6	1.0 – 2.8	
					High NSP vs. SP	2.7	1.7 – 4.3	
Prolonged sick leave								
				9.7				15.6
	Perceived health complaints	3.0	1.9 – 4.8		Fatigue	2.2	1.4 – 3.3	
	Professional expertise	0.6	0.4 – 1.0		Perceived health complaints	2.0	1.3 – 3.0	
					Career opportunities	0.6	0.4 – 0.9	
					Role ambiguity	1.7	1.2 – 2.5	
					Physical workload	1.6	1.1 – 2.3	
					Female sex	1.6	1.1 – 2.4	
					>40 hrs vs. <25 hrs	0.5	0.3 – 0.9	

\*: NSP = non-scientific personnel, SP = scientific personnel

Frequent sick leave was associated with perceived health complaints, emotional exhaustion and having a non-scientific function. Prolonged sick leave was associated with fatigue, perceived health complaints, role ambiguity, higher physical workload and female sex. Good career opportunities and working more than 40 hours a week were associated with less prolonged sick leave.

## **DISCUSSION**

This cross-sectional study focused on health-related and work-related aspects associated with sick leave of chronically ill workers (CIWs) and non-chronically ill workers (NCIW). It was confirmed that CIWs show two times more frequent and nearly three times more prolonged sick leave than NCIW. The main finding of the present study is that health-related aspects (fatigue, emotional exhaustion and perceived health complaints) showed stronger associations with sick leave than various work-related aspects. The differences in the contributions of specific health-related and work-related aspects to the explanation of sick leave between the CIWs and the NCIW were smaller than expected.

### **Aspects associated with sick leave**

Fatigue, emotional exhaustion and/or perceived health complaints were associated with sick leave in every model in both the CIWs and NCIW. A large percentage of the chronically ill suffers from fatigue (Molarius and Janson 2002). It has been suggested, in fact, that fatigue may be a major reason (in combination with other health complaints) to take sick leave or to postpone return to work following sick leave (Kessler et al. 2001; Boot 2004). However, fatigue, emotional exhaustion and perceived health complaints also appear to be associated with sick leave in workers who do not suffer from a chronic disease. The impact of work-related aspects, whether positive or negative, on sick leave appears to be smaller than the impact of health-related aspects. It is possible, however, that work-related aspects contribute indirectly to sick leave via fatigue, emotional exhaustion and perceived health complaints. In a study of the same university population, Donders et al. (2005) found a significant association between various work-related aspects and fatigue, emotional exhaustion and perceived health complaints. Another explanation for the relatively small contribution of the various work-related aspects to sick leave may lie in the rather good job conditions for most of the university population. It is also possible that the job conditions for the workers with chronic diseases have been adjusted to prevent sick leave. The latter may also explain the rather small differences in associations between work-related aspects and sick leave found between the CIWs and NCIW.

In the present study, a lower employment function, working part-time and female sex were found to be independently associated with greater amounts of sick leave on the parts of both CIWs and NCIWs. Greater level of sick leave has been previously shown to be associated with working in lower functions and a lower education level (Vahtera et al. 1997; Harvey and Nicholson 1999). Many factors have been assumed to contribute to this situation, including job conditions, physical workload, life style and personal characteristics (Gründemann and Nijboer 1998; Harvey and Nicholson 1999). It can also be hypothesized that more CIWs are found among lower employment functions precisely because of their chronic condition.

In general, women take more sick leave than men (Van Deursen et al. 1999; Kessler et al. 2001). Women also perceive more health complaints and report more fatigue, which have both been shown to be strongly associated with sick leave (Bensing and van Lindert 2003; CBS 2003c). Differences in both work-related and family-related aspects may also play a role in the higher prevalence of sick leave among women than among men (Van Deursen et al. 1999).

Working more than 40 hours a week was found in the present study to be associated with less sick leave, which fits in with the findings of other studies that show higher sick leave among part-timers (Gjesdal and Bratberg 2002). It is possible that part-timers have more duties outside their job and, therefore, are more vulnerable to an imbalance between workload and work capacity, resulting in a higher risk for sick leave. Also, part-timers may have less commitment to their work, which has been shown to be associated with greater sick leave (Gründemann and Nijboer 1998). The finding of a significantly larger percentage of part-timers in the CIWs than in the NCIWs also suggests selection of part-time work due to poor (physical) condition.

Older CIWs and NCIWs showed less sick leave than workers younger than 36 years of age, which is consistent with the literature (Van Deursen et al. 1997; Vahtera et al. 1997; Harvey and Nicholson 1999) and may be partly due to the 'healthy survivor effect': healthy employees are selectively retained in the work force while unhealthy employees are removed.

Work-related aspects exerted the most effect on prolonged sick leave. One explanation for this finding may lie in the fact that high commitment as a result of perceived professional expertise (in CIWs) or career opportunities (in NCIWs) stimulates a quick return to work after sick leave. Negative work-related aspects, such as role ambiguity and physical workload (in NCIWs) may, conversely, contribute to a more prolonged absence.

In general, the differences in scores on health-related and work-related aspects between the CIWs and NCIWs studied here were not as large as expected. The CIWs scored significantly higher than the NCIWs on all the health-related aspects, although the differences were small (Table 3). The scores on the work-related aspects (Table 3)

also showed relatively small differences between the CIWs and NCIWs and -although statistically significant- they were, perhaps, not very relevant. As already mentioned, adjustments in the tasks and job conditions of CIWs in particular, may possibly account for the finding of such small differences.

The percentages of the variance in sick leave explained by the final models ranged from 8% to 16%, which is comparable to the results of another Dutch study of work, private situation, behavioural risks and sick leave (Van Deursen et al. 1999). In their examination of the determinants of sick leave in men and women, however, chronic disease was not taken into account.

### **Methodological considerations**

The response rate for the present study was 49%. In general, this is sufficient for such an analytic study (Kristensen 1995). It is possible that selection bias occurred because persons in ill health and/or with high workload did not return the questionnaire. However, we were not able to investigate the characteristics of the non-responders properly because of the anonymous study design. Nevertheless, we believe there is no reason to expect the CIWs to answer the questions essentially differently from the NCIWs; the questionnaire addressed a variety of themes and did not emphasise chronic disease or sick leave. Nearly 25% of the respondents reported chronic disease, which is comparable to the self-reported prevalence of 23% found in a national survey conducted in 2000 (CBS 2001). Our results showed the CIWs to be older and less well educated than the NCIWs, which is consistent with the general Dutch population (CBS 2003a). However, the education level of university personnel as a whole is very high compared with that of the general population, which limits the generalisation of the present results. In the year of data collection, general sick leave in this population was 4.6%, which was lower than the national value of 5.4% (CBS 2003b).

A limitation of this study was the cross-sectional design. Because of this, the causal relations between the health-related and work-related aspects and the measures of sick leave cannot be determined. It is possible that the health condition of the respondents influenced the perception of work-related aspects. In a longitudinal study it would be possible to estimate this potential effect by comparing the scores over time, assuming that objective work situations stayed unchanged.

To guarantee some degree of reliability and validity, we used parts of already validated questionnaires in the present study to attain information on health, chronic disease, demographic characteristics, work-related aspects and sick leave. The internal consistency of the questionnaire items was generally good. A possible problem with self-reported data is that the information may be less reliable; misclassification and recall bias can influence the results (Kleinbaum et al. 1982). Unfortunately, it was not possible to compare the self-reports of sick leave with actual sick-leave registration

from the university. It is known from the literature, however, that sick leave is reported reliably when subjects are asked about the past six months (Burdorf et al. 1996). It has to be bared in mind, though, that self-reported sick leave is not as reliable as company records (Van Poppel et al. 2002). There might be some underestimation of self-reported sick leave among those with high or frequent sick leave. Probably, those respondents were still classified correctly into the category frequent or prolonged sick leave, since the chosen cut-off points were rather low.

It is, nevertheless, possible for some bias to exist in the classification respondents as CIWs or NCIWs on the basis of self-reported data, resulting in an underestimation of the differences and associations under study. However, it is known from the literature that the self-reporting of chronic disease is reasonably reliable. High agreement has been found between self-reported and registered diabetes or cardiovascular disease, while the agreement between self-reported and medically diagnosed musculoskeletal or respiratory problems has been lower (Heliövaara et al. 1993; Kriegsman et al. 1996). Respondents with a higher level of education, as in the present study, also report more reliably than respondents with a lower level of education (Heliövaara et al. 1993).

In the model with prolonged sick leave for NCIWs, more work-related aspects are retained than in the model for CIWs. This may be explained by more power in the NCIW group ( $n = 1347$  vs.  $n = 444$ ).

It is possible that the questionnaire used in the present study did not cover all issues associated with sick leave on the part of CIWs in particular. The questions may have been too global to detect the specific problems confronting CIWs (Detaille et al. 2003). Moreover, it is possible that the category 'chronic disease' was too heterogeneous. A more specific categorisation of chronic disease might have shown different results. As demonstrated by Detaille et al. (2003), there are common necessities for people to keep on working, but the priority of these necessities differs for the investigated groups of chronic diseases. However, in our study, the numbers of respondents with a specific chronic disease were too small to perform separate analyses for each chronic disease.

## CONCLUSIONS

In the present study, the CIWs were found to take 2-3 times more sick leave than their non-chronically ill colleagues. Fatigue, emotional exhaustion and perceived health complaints showed the strongest associations with sick leave in both the CIWs and NCIWs. The different patterns of associations with sick leave were only partly explained by various health-related and work-related aspects, which did not answer the question of why CIWs show more sick leave than NCIWs. In any case, the presence of



chronic disease should be taken into account in future studies on sick leave. Questionnaires specially designed for use with chronically ill workers, who often face several specific disease-related problems, should also be developed.

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**Fatigue, emotional exhaustion and perceived health complaints  
associated with work-related characteristics  
in employees with and without chronic diseases**

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## ABSTRACT

**Objectives:** Ageing of the Dutch working force and increasingly more stringent restrictions regarding early retirement and disability benefits are leading to higher numbers of workers with ill health. Until now, only a few studies have explored how employees with ill health perceive their work. This study investigated possible differences in scores on fatigue, emotional exhaustion, perceived health complaints and various work-related characteristics between chronically ill (CIWs) and non-chronically ill workers (NCIW), as well as differences in associations between work- and health-related characteristics. **Methods:** A questionnaire was sent to all employees of a Dutch university to collect data on perceived work-related and health-related characteristics (response: 49.1%). Differences in various scores were analysed using  $\chi^2$ -tests and the General Linear Model. Associations between the work- and the health-related characteristics were determined by multiple linear regression analyses in the CIWs (n=444) and NCIW (n=1347) separately. Interaction terms were included to detect differences between the two groups. **Results:** The results indicated that the CIWs had less favourable scores on the three health-related characteristics. Also, the CIWs scored less favourably than the NCIW on almost all the work-related characteristics. In the two groups, negative work-related aspects, such as higher work pressure, contributed most to explaining the variance in the health-related characteristics. However, in the CIWs, fatigue was not explained by the work-related aspects as much as in the NCIW. In the CIWs, the association between unpleasant treatment and the health-related characteristics was stronger than in the NCIW, but there were indications that autonomy, possibilities for learning and social support from superiors also played an important role. **Conclusions:** CIWs perceived more fatigue, emotional exhaustion and health complaints than NCIW. There were different patterns of associations between work- and health-related characteristics in the NCIW and CIWs. Future studies on associations between work-related characteristics and health should take the presence of chronic disease into account.

**Keywords:** chronically ill workers, fatigue, health complaints, psychosocial workload

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## INTRODUCTION

Since the end of the nineteen eighties, the Dutch government has been attempting to promote participation in employment, among other things to spread the financial burdens of health care, social welfare and pension schemes (that will increase due to ageing of the population) over a larger number of people with paid employment (Kerkhofs et al. 2000). This policy is expressed for example in the recent plans to increase the retirement age by constraining pension regulations. In addition, it has become much more difficult to be declared disabled and it is strived for that as many people as possible who are receiving unemployment benefits or disability pension will find jobs in the short-term (Wevers et al. 1996). If this government policy succeeds, it will mean that a large proportion of workers have non-optimal health. This not only applies to the sixty-year-olds who cannot take early retirement and to the people who have been excluded from receiving disability pension, but also to newcomers to the labour market: research has shown that a larger proportion of unemployed people suffer from health problems than people with paid jobs (Wetenschappelijke Raad voor het Regeringsbeleid 2001). Frequently, adjustments in the work situation will be necessary in order to make it possible for employees with non-optimal health to function adequately.

Until now, very little research has been performed into the question of how employees with ill health perceive their work. Do they experience the same problems as their healthy colleagues? Or do they complain about more or different aspects of their work? It is necessary to gain more insight into work-related characteristics that might cause problems, to help advise employers about desired adjustments to the working environment or workload.

If the burden from the work or from work-home interference becomes too high, this can lead to health effects, such as fatigue, emotional exhaustion and perceived health complaints (Van Dijk et al. 1990; Donders et al. 2003). Many employees complain of fatigue. Prevalence rates of chronic fatigue in the general population vary widely: depending on the definition and measurement method used, they vary from 7% to 45% (Lewis and Wessely 1992). In a large cohort study on the working population in the south of the Netherlands, a recent prevalence of 22% 'long-term fatigue' has been established (Kant et al. 2003). In the case of emotional exhaustion, a central symptom of burnout, the feeling of being mentally and emotionally 'spent' was found to be correlated with chronic overburdening at work (De Ridder et al. 2000). Besides fatigue and emotional exhaustion, a person's perceived health in broader terms serves as a relevant means to measure health status. Perceived health complaints appeared to be associated with work-related characteristics (Karasek 1979; Smulders and op de Weegh 1995; Donders et al. 2003; Sluiter et al. 2003) and absenteeism, both in

chronically ill and non-chronically ill workers (Van Deursen et al. 1997; Roskes et al. 2005).

Recent research has shown that chronically ill workers have higher levels of fatigue (Franssen et al. 2003; Boot 2004) and absenteeism than their healthy colleagues (Kessler et al. 2001; Baanders et al. 2002; De Vroome and van Putten 2003). Fatigue was often found to be a concomitant and very invalidating symptom of the chronic disease concerned (De Ridder et al. 2000; Swain 2000; Franssen et al. 2003; Weijman et al. 2003). By correcting for chronic disease, such as for example in the study on fatigue by Bültmann et al. (2002a), meaningful differences between the chronically ill and their healthy counterparts may have been missed. Possible differences in associations between work-related characteristics and health effects will be more easily identifiable if separate analyses are performed on the two groups.

In this study, the work perceptions of workers with chronic diseases were compared to the perceptions of workers without chronic diseases. Data were available from a questionnaire survey on work and health in employees at a Dutch university. Differences in scores on fatigue, emotional exhaustion, perceived health complaints and work-related characteristics were investigated between these two groups. In addition, data from the chronically ill workers (CIWs) and the non-chronically ill workers (NCIW) were analysed separately to see whether there were differences in associations between work-related characteristics and the three health-related characteristics in the two groups.

## **METHODS**

### **Data collection**

Data for the present study were obtained via a questionnaire mailed to the home addresses of all the workers at a Dutch university. By means of an accompanying booklet, the employees were informed about the objectives of the study and assured that their responses would be handled with confidentiality. After three weeks, all the workers received a reminder. Both the University Board and Works Council of the university approved the study. Demographic characteristics that have been mentioned as potential confounders in the literature (e.g. sex, age, employment function, hours worked weekly) were included in the questionnaire (Van de Mheen et al. 1999; McDonough and Walters 2001; Kessler et al. 2001; Molarius and Janson 2002), as well as chronic disease, work- and health-related characteristics.



*Demographic characteristics*

Sex was coded as 0 = male and 1 = female. Age was divided into four categories: <36 years (1), 36-45 years (2), 46-55 years (3) and >55 years (4). Education level was categorised into three categories: primary school/lower vocational education, secondary/higher vocational education or university. Based on occupation and education level, employment function was categorised as: lower-educated non-scientific personnel (1 = low NSP), higher-educated non-scientific personnel (level of education is college or university degree; 2 = high NSP) or scientific personnel (3 = SP). Total numbers of hours worked weekly (all jobs together, including overtime) were categorised as: <25 hours (1), 25-40 hours (2), >40 hours (3).

*Chronic disease*

In response to the question 'Do you have a chronic disease?' the respondents could choose from the following options: no, diabetes, psychological disorder (depression, anxiety, addiction), cancer, cardiovascular disease, respiratory disease (asthma, bronchitis, COPD), neurological disease (Parkinson, multiple sclerosis, et cetera), musculoskeletal complaints (rheumatic arthritis, osteo-arthritis, et cetera), or 'other, namely...'. These options correspond with the chronic diseases most prevalent in the Netherlands (Van den Bosch et al. 2000). Those respondents who gave a positive answer to one or more of these chronic diseases were categorised as chronically ill workers (CIWs). Those respondents who marked the option 'other, namely...' were also considered to be chronically ill when their disease fell within one of the following newly formed categories: skin disease or gastro-intestinal disease. The remaining respondents were considered individually and categorised as CIWs when they were indeed found to have a disease in the category 'other, namely...'. Any respondents who reported a complaint that could not be assumed to be a chronic disease (e.g. often having a cold) or who simply did not answer the question on chronic disease were excluded from the analyses (n = 52). All the other respondents were categorised as non-chronically ill workers (NCIW's).

*Health-related characteristics*

Fatigue (four items) was assessed using the Shortened Fatigue Questionnaire (Alberts et al. 1997; Boot 2004). Emotional exhaustion (four items) was measured using the Dutch version of the Maslach Burnout Inventory (De Jonge et al. 2000). Perceived health complaints were measured using the VOEG-13 that includes 13 dichotomous items to assess whether a person occasionally suffers from a range of psychosomatic complaints (Dirken 1969; Geurts et al. 1999).

### *Work-related characteristics*

Work-related characteristics were assessed using various parts of previously validated questionnaires. Work variety (three items) and professional expertise (two items) were measured using the Maastricht Risk Assessment Questionnaire (De Jonge 1994; De Jonge et al. 2000). Work pressure (eight items) and autonomy (ten items) were measured using the Maastricht Autonomy Questionnaire (De Jonge et al. 1995). Role conflict (five items), role ambiguity (five items), social support from superiors (five items) and social support from colleagues (five items) were measured using the Questionnaire Organizational Stress-D (Bergers et al. 1986). Information on work (three items), communication (four items), possibilities for learning (four items), decision latitude (nine items) and physical workload (three items) were assessed using the Questionnaire on Experience and Evaluation of Work (Van Veldhoven and Meijman 1994; Van Veldhoven and Broersen 1999). Career opportunities (three items) and employment terms (five items) were also measured (De Jonge et al. 2000; Donders et al. 2003).

### **Analyses**

The small number of respondents with missing data (mean percentage 1.7%) on health- and/or work-related items were assigned the mean item score for the corresponding category of employment function. Item scores on fatigue and perceived health complaints were summed for every respondent and mean item scores were calculated for emotional exhaustion and all the work-related characteristics. Cronbach's alphas were calculated for each of the health- and work-related characteristics. A Cronbach's alpha of 0.70 or higher was taken to reflect good internal consistency (Nunnally 1978). Cronbach's alphas were high for the health-related characteristics ( $>0.75$ ). Most of the work-related characteristics also had high Cronbach's alphas ( $>0.70$ ), with the exception of work variety (0.67), career opportunities (0.68) and employment terms (0.63).

### *Differences between CIWs and NCIWs*

Demographic data of the CIWs and NCIWs were compared using the  $\chi^2$ -test. Mean scores of the CIWs and NCIWs on the various health- and work-related characteristics were compared using the General Linear Model (GLM). Sex, age, employment function and hours worked weekly were included as 'fixed factors', in order to adjust for potential confounding influences (Van de Mheen et al. 1999; McDonough and Walters 2001; Kessler et al. 2001; Molarius and Janson 2002). The significance level in all the tests was set at  $p \leq 0.05$ .

*Associations between work- and health-related characteristics*

Linear regression (enter method) was used to investigate the degree to which the different work-related characteristics contributed to explaining the variation in emotional exhaustion, fatigue and perceived health complaints. Analyses were performed on the total population, with presence of chronic disease as variable in the model. In addition, separate analyses were performed on the CIWs and NCIWs to investigate where differences were present between the two groups. If the regression coefficient in one group was clearly higher than that in the other group, then an interaction term was made between presence of chronic disease and the relevant work-related characteristic by multiplying the variables with each other. Subsequently, regression models were calculated that also included the relevant interaction terms. The interaction terms between presence of chronic disease and the potential confounders sex, age, employment function and hours worked weekly, were included in each model, irrespective of whether there were differences between the two groups. All the analyses were conducted in SPSS 12.0.1.

**RESULTS****Response rate and characteristics of the population**

A total of 3881 questionnaires was distributed and 1843 were returned, which yielded a crude response rate of 47.5%. However, 16 people indicated the receipt of two questionnaires because they had more than one job at the university, 41 questionnaires were returned as undeliverable and 73 individuals were no longer employed at the university anymore. The adjusted response rate was 49.1%. Compared to the sex distribution in a personnel database, fewer men than women responded ( $\chi^2 = 71.8$ ,  $p < .001$ ). Analyses were performed on 444 CIWs (24.8%) and 1347 NCIWs (75.2%). The distribution of chronic disease among the CIWs was as follows: musculoskeletal complaints (33.3%), respiratory diseases (22.1%), psychological disorders (11.7%), cardiovascular diseases (10.1%), diabetes (6.1%), cancer (4.3%), neurological diseases (3.6%), gastro-intestinal diseases (3.2%), skin diseases (3.2%) and other (e.g. allergies, migraine, diseases of the thyroid gland, et cetera) (19.4%). Comorbidity was present in 13.3% of the CIWs.

Significant differences in age, education level, employment function and hours worked weekly were found between the CIWs and NCIWs, but not in sex (Table 1). On average, the CIWs were older than the NCIWs. A higher percentage of the CIWs also had a lower education level and a low NSP function than the NCIWs. Compared to the NCIWs, more of the CIWs worked for <25 hours a week, while fewer of them worked for >40 hours a week.

**Table 1** Demographic characteristics of the study population in percentages.

	NCIW <sup>s</sup> *		CIW <sup>s</sup> *		$\chi^2$
	n	%	n	%	p-value
<b>Sex</b>					.27
Male	724	53.8	224	50.8	
Female	621	46.2	217	49.2	
<b>Age</b>					<.01
< 36 years	478	36.0	104	24.1	
36-45 years	372	28.8	107	24.8	
46-55 years	340	25.6	142	32.9	
> 55 years	137	10.3	79	18.3	
<b>Education level</b>					<.01
Primary school / lower vocational	96	7.1	68	15.4	
Secondary / higher vocational	407	30.3	149	33.8	
University	842	62.6	224	50.8	
<b>Employment function</b>					<.01
Lower-educated non-scientific personnel (low NSP)	331	24.6	141	32.0	
Higher-educated non-scientific personnel (high NSP)	337	28.1	128	29.0	
Scientific personnel (SP)	635	47.3	172	39.0	
<b>Hours worked weekly</b>					<.01
< 25 hours	182	13.6	88	19.9	
25-40 hours	694	52.0	227	51.2	
> 40 hours	458	34.3	128	28.9	

\* NCIW<sup>s</sup> = non-chronically ill workers, CIW<sup>s</sup> = chronically ill worker.

### Work- and health-related characteristics in CIWs and NCIW<sup>s</sup>

The CIWs reported significantly higher scores on fatigue, emotional exhaustion and perceived health complaints than NCIW<sup>s</sup> (Table 2). In addition, the scores of CIWs on work-related characteristics in general were less favourable than those of NCIW<sup>s</sup>. The CIWs had significantly higher scores than the NCIW<sup>s</sup> on the negative work-related characteristics physical workload and role conflict. Regarding the positive work-related characteristics, the scores of the CIWs were significantly lower, especially on social support from superiors and colleagues, decision latitude and career opportunities. The associations between the work-related characteristics and the health-related characteristics are shown in Table 3.

**Table 2** Mean scores and standard deviations (SD) for the health- and work-related aspects (adjusted for sex, age, employment function and hours worked weekly).

	Nr of items	Range*	Mean (SD)		GLM
			CIWs <sup>+</sup> (n = 428)	NCIW <sup>+</sup> s <sup>+</sup> (n = 1321)	p-value
<i>Health-related aspects<sup>#</sup></i>					
Fatigue	7	4 – 28	14.47 (6.78)	11.64 (7.85)	<.001
Emotional exhaustion	4	1 – 5	2.63 (.99)	2.40 (1.14)	<.001
Perceived health complaints	13	0 – 13	3.88 (2.57)	2.34 (2.98)	<.001
<i>Negative work-related aspects<sup>#</sup></i>					
Role conflict	5	1 – 4	1.70 (.45)	1.63 (.52)	.008
Work pressure	8	1 – 5	3.10 (.72)	3.05 (.84)	.220
Role ambiguity	5	1 – 4	2.03 (.61)	1.97 (.71)	.048
Physical workload	3	1 – 4	1.70 (.58)	1.53 (.67)	<.001
<i>Positive work-related aspects<sup>+</sup></i>					
Employment terms	5	1 – 5	3.58 (.87)	3.45 (.75)	.001
Work variety	3	1 – 5	3.17 (.67)	3.25 (.78)	.033
Information on work	3	1 – 4	2.93 (.68)	3.01 (.72)	.021
Career opportunities	3	1 – 5	2.49 (.94)	2.64 (1.09)	.002
Communication	4	1 – 4	2.63 (.69)	2.73 (.80)	.012
Professional expertise	2	1 – 5	4.03 (.79)	4.07 (.82)	.388
Possibilities for learning	4	1 – 4	2.76 (.65)	2.85 (.76)	.009
Decision latitude	11	1 – 4	2.59 (.61)	2.69 (.71)	.002
Autonomy	8	1 – 5	3.45 (.70)	3.52 (.74)	.060
Social support from superiors	5	1 – 4	3.14 (.68)	3.28 (.79)	<.001
Social support from colleagues	5	1 – 4	3.17 (.56)	3.29 (.65)	<.001
Well-being at work	3	1 – 5	3.81 (.76)	3.90 (.88)	.027

\*: 'Fatigue' and 'perceived health complaints' are sum scores, all other scales are mean item scores.

†: CIWs = chronically ill workers, NCIW<sup>+</sup>s = non-chronically ill workers.

<sup>#</sup>: On these scales, a higher score is unfavourable.

<sup>†</sup>: On these scales, a higher score is favourable.



*Chronic disease*

Presence of chronic disease was included as variable in the model that contained the total population. The results showed that the presence of chronic disease was positively associated with each of the three health-related characteristics (Table 3). The association with emotional exhaustion was less strong than with perceived health complaints, while the association with fatigue lay between these.

*Fatigue*

In the total population, higher scores on the negative characteristics role conflict, work pressure, role ambiguity and physical workload were associated with more fatigue. Greater satisfaction with employment terms, work variety, information on work, possibilities for learning and support from colleagues were associated with less fatigue. In the separate analyses on the CIWs and NCIWs, role conflict, work pressure, role ambiguity, physical workload, employment terms, information on work and social support from colleagues played a part in the NCIWs, but not in the CIWs. Unpleasant treatment and autonomy played a part in the CIWs, but not in the NCIWs. The difference in unpleasant treatment between the CIWs and NCIWs was significant: this interaction term was retained in the last regression model. This means that in the CIWs, unpleasant treatment played a more important part than in the NCIWs. In the NCIWs, the work-related characteristics explained a larger proportion of the variance in fatigue than in the CIWs (24% vs. 16%).

*Emotional exhaustion*

More role conflict, work pressure, role ambiguity and physical workload were associated with more emotional exhaustion. Particularly work pressure played a large part ( $\beta=0.32$ ). Employment terms, work variety, possibilities for learning, social support from superiors and from colleagues were negatively associated with emotional exhaustion, which means that a higher score on these work-related characteristics was related with less emotional exhaustion. More autonomy, however, was associated with more emotional exhaustion.

In the separate analyses, differences were found in unpleasant treatment, role conflict, physical workload, communication, possibilities for learning, social support from superiors and from colleagues between the NCIWs and CIWs. On the basis of the interaction terms, it appeared that unpleasant treatment in the CIWs was more strongly associated with emotional exhaustion, whereas in the NCIWs, there was a stronger association with physical workload. The other differences were not statistically significant. Percentages of explained variance were comparable between the NCIWs and CIWs: 37% and 36%, respectively.

### *Perceived health complaints*

Once again, associations were found with negative work-related characteristics: more unpleasant treatment, role conflict, work pressure, role ambiguity and physical workload were associated with more perceived health complaints. In the total population, the positive work-related characteristics work variety and information on work played a part. In addition, it was found that more social support from colleagues was associated with fewer perceived health complaints.

Differences between the NCIWs and CIWs occurred in unpleasant treatment, role conflict, work pressure, physical workload, work variety and social support from colleagues. The interaction model showed that this difference was only significant for unpleasant treatment: the association was stronger in the CIWs than in the NCIWs. Percentages of explained variance were slightly higher in the CIWs: 28% vs. 20%.

### *Sex, age, employment function and hours worked weekly*

Sex, age, employment function and hours worked weekly were included as potential confounders. Table 3 shows that women experienced more fatigue and health complaints than men. This applied to the CIWs and NCIWs. Younger workers in the NCIW group reported more fatigue and emotional exhaustion than the older workers. In the case of fatigue, the interaction term between presence of chronic disease and age remained in the model, which means that the association between age and fatigue was stronger in the NCIWs than in the CIWs. In the total population and in the NCIWs, people with a higher-ranking job reported more fatigue and exhaustion than workers with lower-ranking jobs. A negative association was found between hours worked weekly and fatigue in the total population and in the NCIWs: more hours worked weekly was associated with less fatigue.

## **DISCUSSION**

This study investigated whether there were differences in scores on the health-related characteristics fatigue, emotional exhaustion and perceived health complaints and various work-related characteristics between workers with chronic diseases and those without chronic diseases. In addition, it was investigated whether there were associations between work-related characteristics and health-related characteristics and whether there were differences between the CIWs and NCIWs.

Comparison of the two groups showed that on average, the CIWs were older, had a lower education level, lower-ranking jobs and more of them were employed part-time than NCIWs (Table 1). These findings support those from other research (Wevers et al. 1996; Merens et al. 2000; Franssen et al. 2003; CBS 2003a). Generally, it has been



found that more women have chronic diseases, but in the present study, this difference was very small.

After correction for sex, age, employment function and hours worked weekly, CIWs had fewer positive work-related characteristics in their work and more negative characteristics (Table 2). Merens et al. (2000) reported the same on the basis of national rates. They remarked that it remained unclear whether CIWs did indeed have poorer jobs (which was possible in view of their lower education level and lower employment status) or whether it was chiefly a perception effect in which the work was experienced as heavier because the people in question were feeling more vulnerable. In our study group, it is most likely that particularly the latter played a part. The CIWs and NCIWs were working for the same employer and it is improbable that this employer was creating better working conditions for NCIWs than for CIWs.

### **Associations between work- and health-related characteristics**

The regression model with interaction terms showed that there were significant differences between NCIWs and CIWs regarding unpleasant treatment and in the association between physical workload and fatigue. It was striking that in each of the three health-related characteristics, unpleasant treatment came forward as a bottleneck in the CIWs. Differences in the association between physical workload and fatigue between the two groups were not very relevant: in the CIWs there was no association, whereas in the NCIWs, the association was significant but weak ( $\beta = 0.08$ ).

Separate regression analyses on the two groups showed that in the NCIWs, more work-related characteristics had a significant association than in the CIWs. However, the NCIW group was much larger than the CIW group ( $n=1347$  and  $n=444$ , respectively), which means that regression coefficients will pass the significance level more quickly in the NCIWs. This occurred for example in the association between work variety and emotional exhaustion. In the two groups,  $\beta$  was 0.08, but in the CIWs, this association was not significant. When regression coefficients of larger than 0.10 (Cohen 1977) were taken into account, it was found that particularly the negative work-related characteristics contributed to explaining the variance in the three health-related characteristics.

In the two groups, support from superiors was associated with less emotional exhaustion, but there were indications that the role of social support from superiors was more important in the CIWs than in the NCIWs. Daille et al. (2003) also reported that social support from superiors was an important factor in a study on people with chronic diseases. Work adjustments are crucial in order to retain employment for employees with chronic diseases (Wevers et al. 1996). In most cases, this does not mean that adjustments need to be made to the physical working environment, but

instead, changes are needed in the tasks, increasing job control, lowering of the work pace and changes in working hours. The barrier against actually using such facilities is smaller when the employee feels supported by his/her superiors (Wevers et al. 1996; Dettle et al. 2003).

According to theories on work-related stress, sufficient job control is essential to prevent (psychological) stress and health complaints (Karasek 1979; Johnson and Hall 1988). On the basis of these findings, it was expected that decision latitude and autonomy would have a protective influence on health effects (Karasek 1979). However, the results did not show any significant association between decision latitude and health-related characteristics. In a previous study on this population of university employees, Donders et al. (2003) were also unable to demonstrate any association. A probable explanation is that all the employees within the business-culture of a university have sufficient decision latitude. Thus, this aspect did not make any notable contribution to the explained variance. In the total population, autonomy was positively associated with fatigue and emotional exhaustion. A plausible explanation is that people make greater use of possibilities in the area of autonomy owing to their health problems.

In the NCIW group, fatigue was stronger related with role conflict, role ambiguity and physical workload compared with the CIWs. Moreover, stronger associations were found between social support from colleagues and emotional exhaustion and between work variety and perceived health complaints.

Besides differences, several similarities were found between the NCIWs and CIWs: in the two groups, there was an association between work pressure and the three health-related characteristics and between employment terms and emotional exhaustion. The same applied to the association between physical workload and perceived health complaints and to possibilities for learning and emotional exhaustion. The latter two associations were slightly stronger in the CIWs than in the NCIWs.

Percentages of explained variance for fatigue due to work-related characteristics were higher in the NCIWs than in the CIWs. In people with chronic diseases, fatigue depends to a large extent on their diseases (Swain 2000; Houtman et al. 2000; Sharpe and Wilks 2002; Bensing and van Lindert 2003). People with chronic diseases often experience changes in their daily functioning, such as decreased physical or mental activity (Franssen et al. 2003). This has a negative influence on the general state of health and on psychosocial functioning. In addition, fatigue is often a symptom of the chronic diseases itself (Franssen et al. 2003; Weijman et al. 2003). The part played by work-related characteristics was therefore somewhat smaller in CIWs than in NCIWs.

Emotional exhaustion in the NCIWs and CIWs was explained to an equal degree by work-related characteristics. A probable explanation is that emotional exhaustion (as formulated in the questionnaire) expressly concerned work-related tiredness.

Particularly work pressure was associated with a higher score on emotional exhaustion, which confirmed the results of other research (Houtman et al. 2000). Emotional exhaustion can predominantly be considered as mental tiredness. Physical limitations in people with chronic diseases do not necessarily have any influence on this. It was striking that physical workload did play a part in the NCIWs, although the association was rather weak.

Perceived health complaints were explained to a larger extent by work-related characteristics in the CIWs than in the NCIWs. These complaints were assessed using the VOE-13. The questions in the VOE-13 address physical complaints that are often labelled as functional or psychosomatic, but can also form part of a physical disorder (Furer et al. 1995). This might partly explain the higher VOE scores in CIWs. Percentages of explained variance were higher in the CIWs than in NCIWs, which indicated that work-related characteristics, such as unpleasant treatment and physical workload, nevertheless played a part. The largest association, however, was found with physical workload. Owing to their poorer health, CIWs had less capacity and therefore became more easily physically overburdened (Wevers et al. 1996; Merens et al. 2000; Weijman et al. 2003). This might mean that benefit can be gained from improving the working conditions so that despite their poorer health, CIWs can function as well possible. It is important in this respect to emphasize that people with chronic diseases were somewhat over-represented among the workers with a lower education level and with a lower-educated non-scientific function. Particularly in these groups, the work is often heavier in a physical sense (Merens et al. 2000).

The women had higher average scores on fatigue and perceived health complaints than men, both in CIWs and NCIWs. These findings agree with the results from many other studies that showed more health complaints in women (Donders et al. 2003) and more fatigue than in men (Bültmann et al. 2002a; Bensing and van Lindert 2003; CBS 2003b). In CIWs, fatigue did not appear to be associated with age, whereas in NCIWs, particularly the younger workers seemed to have more fatigue. In general, relationships between age and fatigue are not very clear (Griffiths 2000; Bültmann et al. 2002b).

In the NCIWs, there were indications that workers with higher-ranking jobs experienced greater fatigue and emotional exhaustion. On average, the part played by employment function was not very large. Bültmann et al. (2001) described that it were particularly work-related characteristics and not so much job descriptions that contributed to the explanation of fatigue and psychological complaints. This was confirmed by the present research, because the contributions of (negative) work-related characteristics were greater than employment function.

## **Methodological considerations**

A limitation of the present study was the cross-sectional design. It was assumed that work-related characteristics led to health effects, but as they were measured simultaneously, it was not possible to say anything about the causality or direction of the associations found.

The proportion of employees with chronic diseases in the study population was comparable with the prevalence of self-reported chronic diseases in the Dutch working population (CBS 2001; Kant et al. 2003). Owing to the fact that the data were gathered anonymously, it is impossible to establish whether selective non-response occurred. Our results showed that the CIWs were older and had a lower education level than the NCIWs, concordant with the situation in the Dutch population (CBS 2003a). The education level of our study population of university employees, however, was higher than the average level in the general population, which means that the generisability of the results is only limited.

The information on chronic diseases, demographics, work-related characteristics and the three health-related characteristics were obtained with the aid of a questionnaire that was compiled from (parts of) validated questionnaires. Internal consistency of the scales was generally good. A point of consideration is whether the questions on work-related characteristics were distinguishing enough for CIWs. It is possible that the questions were too general to adequately assess the specific problems chronically ill people experience at work (Detaille et al. 2003).

Misclassification of the workers into the categories chronically ill and non-chronically ill may have affected the results (Kleinbaum et al. 1982) and led to underestimation of the differences. Kessler et al. (2001) reported that recall bias, ignorance or unwillingness to admit to having a chronic disease due to possible stigmatisation may be of influence. However, other literature showed that the reliability of self-reported chronic diseases was moderate. Particularly self-reported cardiovascular diseases and diabetes were in agreement with the professional diagnosis, whereas there was less agreement in the case of musculoskeletal complaints and lung disorders (Heliövaara et al. 1993; Kriegsman et al. 1996). Respondents with a high education level, like many of the participants in this study, reported more in agreement with the medical diagnosis than those with a low education level (Heliövaara et al. 1993). It is unlikely that the CIWs filled in the questionnaire differently from the NCIWs through deviations in involvement in the study, because the questionnaire addressed many subjects and did not lay emphasis on being chronically ill.

In this study, chronic diseases were analysed as one group, without making any distinctions between diagnoses and comorbidity. Analysing differences between various chronic diseases was not possible due to the small numbers of the sub-groups.

However, it is possible that in the various diagnostic categories, there were differences in associations between work-related characteristics and health-related characteristics. The study by Detaille et al. (2003) showed that different groups of chronically ill employees were experiencing the same bottlenecks, but their prioritization varied. For example, support from superiors was the most important characteristic in workers with rheumatoid arthritis, whereas this characteristic took third place in workers with diabetes mellitus.

This study focused solely on associations between the three health-related characteristics and psychosocial work-related characteristics. However, it is possible that other factors also play a part, such as factors in private life (e.g. demands at home, leisure time activities), work-family interference and individual characteristics (e.g. health behaviour, coping style) (Bültmann et al. 2002a).

## **CONCLUSIONS**

This study showed clear differences in the scores on work- and health-related characteristics between CIWs and NCIWs. In addition, differences were found in the work-related characteristics that contributed to the explanation of fatigue, emotional exhaustion and perceived health complaints. Particularly unpleasant treatment played a larger role in the CIWs than in NCIWs. Fatigue in the CIWs was explained to a smaller extent by work-related characteristics than in the NCIWs, probably because the chronic disease itself had the most influence on this. Perceived health complaints were explained more strongly by work-related characteristics in the CIWs than in the NCIWs. Based on the differences found in this study, we recommend that in future research, distinctions should be made between people with and without chronic diseases. Important differences will be missed by simply correcting for chronic diseases. Within the working population, chronically ill workers should be considered as a group with lower capacity. They will derive extra benefit from attention to the work-related problems that they experience.

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*Work-family interference*





**Work-family interference:  
a literature review on measuring instruments and  
research models regarding combining work and family care**

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## ABSTRACT

In the last decades, many studies have focused on combining work with household chores and taking care of children. This article provides an overview of hypotheses regarding the relationship between work, care and health. Moreover, we studied the way work-family interference (WFI) is measured. In 1985, Greenhaus and Beutell stated that three forms (time, strain and behaviour) and two directions (work→family and family→work) could be distinguished. However, there are hardly any instruments that take these six dimensions into consideration. In the literature varied models are described, representing the relationships between determinants, WFI and outcome measures. WFI is mostly used as a mediating variable. Outcome measures frequently regard work satisfaction or life satisfaction. However, little attention is paid to health effects and sick leave. Because many different measures are used, not only for WFI, but for the determinants and the outcomes as well, research findings are ambiguous. A plea is made for more uniformity of measurement. At the end of this review, recommendations for future research are given.

**Keywords:** work-family interference, combining work and care, questionnaires, health effects

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## INTRODUCTION

The relationship between work and family life is becoming ever more interesting. This is due in part to the disappearance of a clear separation of work and home caused by working overtime, working at fluctuating times and working from home, made possible by advancements in technology (Burke 1988; Barnett 1998). Aside from this, work has become less physically but more mentally and emotionally burdensome. The emergence of two salary households has also generated extra interest in this subject (Geurts et al. 1999; Wagena and Geurts 2000).

The traditional role patterns of the man working outside the home in a paid job and the woman taking care of the household and children have been replaced to a great extent by two salary households. In 1986, 30% of all Dutch households were comprised of two salaries and 53% was the traditional one salary household. By 1998 it was reversed: 56% of the couples formed two-income households and 34% formed a single-income household (Keuzenkamp and Hooghiemstra 2000). Although more women now work outside the home, they remain the primary caretaker and are still largely responsible for most of the household chores (Hochschild and Machung 1990; Keuzenkamp and Hooghiemstra 2000).

The term used to describe the combination of working both outside the home (and the perceived extra burden of this) and having the majority of the responsibilities of the household chores as well is often referred to as 'double burden' (Bekker 1999; Bekker et al. 2000). The effort-recovery model by Meijman (1989) proposes that working outside the home does not necessarily lead to health problems, as long as there is enough time to recover (Geurts et al. 1999; Bekker et al. 1999). However, coming home from work, the responsibility of the household chores can reduce the recovery time. Serious conflicts can develop trying to fulfil the various roles (employee, partner, parent). The so-called 'work-home conflict', otherwise known as 'work-family interference' can cause health problems (Kolk et al. 1995; Geurts et al. 1999). However, various studies have resulted in showing that working mothers reported a more general well-being and had less health problems than mothers who stayed at home without a paying job (Verbrugge 1983; Kandel et al. 1985; Barnett et al. 1992; Bekker et al. 1999; Bekker 1999). Therefore, the combination of roles does not necessarily lead to health problems.

The following points are raised in this review:

- Which hypotheses i.e. explanations are described in the literature about the relationships between work, family life and general health?
- What is the definition of work-family interference and how can it be measured?
- What position does work-family interference have in research models?

- What are the limitations of previous studies and what could be recommendations for future research?

## **METHODS**

The search for relevant literature included Medline and PsychInfo from 1988 until May 2002. The following terminology was used: 'work family conflict', 'work family interference', 'work home conflict', 'work home interference' and 'work non-work conflict'. We also looked through the reference sections of articles to find other relevant, often cited studies. These, in part, had been published before 1988. Sought after were articles that could define an instrument that could measure work-family interference or could describe a model in which the associations between aspects, such as work/home situations, work-family interference and the outcomes could be defined. The search was restricted to articles and reports written in English or Dutch.

## **OVERVIEW OF THE LITERATURE**

### **Explanations and hypotheses**

Whether or not it is harmful to one's health to fulfil more than one role has not yet been fully determined (Barnett 1998; Bekker et al. 1999). The initial belief was that time and energy are scarce, otherwise known as the *scarcity hypothesis* (Aryee 1992; Bekker 1999). Both work and family life are demanding roles and pose numerous challenges (Barnett 1998). If too much time and energy are spent in one role than the other will suffer (Waldron and Jacobs 1989; Bekker 1999). The scarcity hypothesis states that when individuals are involved in multiple roles, these roles drain them and this leads to a conflict in the various roles and an overall higher demand, which in turn has a negative effect on health and well-being (Waldron and Jacobs 1989; Bekker 1999). This hypothesis could substantiate why women have more health complaints than men in general (Bekker et al. 1999).

The so-called *role expansion hypothesis* states that fulfilling more than one role at a time has benefits (Barnett et al. 1992; Dean 1992). Each role can give a greater sense of accomplishment, therefore a more interesting and complete life. This has emotional advantages which promote a greater feeling of well-being and less health problems (Verbrugge 1983; Waldron and Jacobs 1989). The positive aspects of one role can negate the negative aspects of the other (Bekker 1999). This hypothesis is supported by the many studies which indicate that combining work outside the home with household chores and the caretaker role has a positive effect on one's health (Verbrugge 1983; Kandel et al. 1985; Waldron and Jacobs 1989; Barnett et al. 1992;

Noor 1995). In general, there is more support for the role expansion hypothesis than the scarcity hypothesis (Bekker 1999).

In addition to the above mentioned hypotheses, the *role quality hypothesis* has been described: not the number of roles but (perception of) the quality is of importance (Verbrugge 1983; Waldron and Jacobs 1989; Barnett et al. 1992; Noor 1995; Groenendijk 1998; Bekker 1999). Support for this hypothesis is reported by Groenendijk (1998). In her study, four types of women were classified. A mixture of positive and negative feelings about combining roles were perceived within each type; the balance of these feelings, however, could vary for type to type. Especially in the way women judge their own situation proved of importance between types.

Besides these hypotheses, there are other authors who present so-called models which describe the relationship of combining working outside the home with household chores (Klitzman et al. 1990; Bacharach et al. 1991; Kolk et al. 1995; Kossek and Ozeki 1998). The *compartment model* or *segmentation model* looks at work outside the home and work at home as two separate domains which have no influence on each other (Klitzman et al. 1990; Bacharach et al. 1991; Kolk et al. 1995). Working outside the home doesn't affect the family role and vice versa. However, studies have shown that this model does not reflect reality. Various roles do affect each other (Klitzman et al. 1990; Bacharach et al. 1991; Barnett 1998). The other two models therefore do support an interaction between roles. The *spillover model* states that both positive and negative effects of working outside the home influence the other part of one's life and vice versa (Burke 1988; Klitzman et al. 1990; Bacharach et al. 1991; Barnett 1998; Bekker 1999). The *compensation model* states that negative experiences in one of the roles can be compensated by positive experiences in another (Klitzman et al. 1990; Bacharach et al. 1991; O'Driscoll et al. 1992; Kolk et al. 1995).

The various hypotheses and models are seldom mentioned in the same article. They are, however, comparable to some extent: when negative spillover effects is talked about, this overlaps the scarcity hypothesis, in which the negative effects of combining roles are emphasized. The compensation model is an affirmation of the role expansion hypothesis and the role quality hypothesis, which stress that positive effects can be achieved by fulfilling more than one role at once. Notwithstanding, it is possible that the spillover model applies to some populations and/or aspects of combining roles, whereas in other situations the compensation model is applicable (Kolk et al. 1995; Kossek and Ozeki 1998).

### Definition of work-family interference

A great part of the literature assumes there is a negative interaction between responsibilities in multiple roles and therefore agrees with the (negative) spillover model (Klitzman et al. 1990; Barnett 1998; Allen et al. 2000). Diverse terminology is used when describing the difficulties between paid work and family life (Duxbury and Higgins 1991). The term 'work-family conflict' is used most often in English publications. This is also the case with the most often quoted definition: 'Work-family conflict occurs when an effort to fulfil work role demands interfere with one's ability to fulfil family demands and vice versa' (Greenhaus and Beutell 1985). In this review work-family interference (WFI) is used, as this is more neutral than work-family conflict and allows for the possibility of positive effects when combining roles.

Work-family interference (WFI) is conceptualized differently into theoretical models. Greenhaus and Beutell (1985) indicated that various forms can be differentiated:

- Conflict i.e. interference based on *time*: time spent fulfilling one role cannot be spent on another.
- Conflict based on *strain*: strain that exists in one of the roles influences the performance of another role.
- Conflict based on *behaviour*: the behaviour in one role is inadequate or even incompatible with another role. A classic example is the cool, objective business-like manager at work whose family members expect him to be the warm and caring person at home (O'Driscoll et al. 1992).

Many authors refer to this division. The three forms of WFI can have the same determinants but are conceptually different (Greenhaus and Beutell 1985; Greenhaus et al. 1989; Loerch et al. 1989; Kelloway et al. 1999; Wallace 1999; Carlson et al. 2000). Because strain can be a result of time limitations, it is most likely that time- and strain-based WFI occur at the same instance and are therefore highly correlated. There is evidence of this to be found in the literature (e.g. Greenhaus and Beutell 1985; Carlson 1999).

According to Greenhaus and Beutell (1985), WFI can originate both in the work and/or the family situations. Therefore, a distinction can be made not only by form of interference but also by direction, that is to say between work→family interference (W→FI) and family→work interference (F→WI). Various empirical studies show that W→FI and F→WI are correlated but have different determinants (Gutek et al. 1991; Frone et al. 1992a; Kelloway et al. 1999). If a measuring instrument does not differentiate according to the direction of WFI, then W→FI is mainly measured (Frone et al. 1992a; Gignac et al. 1996; Kossek and Ozeki 1998). This is, among other reasons, because generally there are more items in an instrument about W→FI than F→WI (Kossek and Ozeki 1998).



### **Measuring work-family interference**

The first questionnaires/measuring instruments used to assess WFI had open or single questions of dubious validity (Loerch et al. 1989; Netemeyer et al. 1996; Kossek and Ozeki 1998; Allen et al. 2000; Frone 2000). Such measuring instruments were used mainly during the late seventies and the early eighties (Greenhaus and Beutell 1985; Kossek and Ozeki 1998). Up until now Kopelman's et al. (1983) 'inter-role conflict' scale is used most often, however, often with adjustments such as a selection of items (Kossek and Ozeki 1998; Allen et al. 2000). Gutek et al. (1991) combined four W→FI items from Kopelman et al. (1983) with four items pertaining to F→WI, which resulted in the first instrument that took into consideration the directions of WFI. In several cases these authors also changed the wording by not only asking about family-work conflict but about friend-work conflict as well (for example 'My family/friends dislike how often I am occupied with my work while I am at home'). Too few realized this was a significant improvement, as it also allowed for the possibility of assessing WFI in singles. This measuring instrument by Gutek et al. (1991) is also often used.

Even though the description of WFI by Greenhaus and Beutell was published in 1985 and many authors refer to this description, there are still too few questionnaires which take all the dimensions into consideration (Greenhaus et al. 1989; O'Driscoll et al. 1992; Netemeyer et al. 1996; Kelloway et al. 1999; Carlson et al. 2000; Wagena and Geurts 2000). For the most part, attention is given to W→FI in the literature. If attention is given to differences in the forms of WFI, it is mostly given to time and strain. There is seldom a motivation given for not including interference based on behaviour (Bacharach et al. 1991; Netemeyer et al. 1996; Kelloway et al. 1999). It seems to be that behaviour-based interference is difficult to conceptualize and that little empirical information is available (Greenhaus et al. 1989; Loerch et al. 1989; Kelloway et al. 1999).

Carlson et al. (2000) presented an overview of scales from 25 publications in 2000. In twelve of the publications the direction of WFI is differentiated and in seven the form. Not one measuring instrument in the overview included the six dimensions as explained by Greenhaus and Beutell (1985). Therefore, the authors developed a new measuring instrument. Allen et al. (2000) confirmed, in a recent review, that Carlson et al. (2000) are the only ones who have conceptualized the six dimensions and therefore advise the use of their measuring instrument.

### **Direction of interference**

When the direction of WFI is taken into consideration, one will almost always find more W→FI than F→WI. According to Carlson et al. (2000) it is still unclear whether this is the case for each form (time, strain and behaviour) of WFI. Many explanations

have been given for these findings, one being that more time is spent on work than on household chores/caretaking (Gutek et al. 1991; Parasuraman and Simmers 2001), but more often the explanation is offered that work outside the home is more easily quantified than tasks at home, which results in underreporting the amount of time spent on family work (Gutek et al. 1991; O'Driscoll et al. 1992; Frone et al. 1992a; MacEwen and Barling 1994; Hughes and Galinsky 1994; Adams et al. 1996; Gignac et al. 1996; Adams and Jex 1999; Kelloway et al. 1999; Cinamon and Rich 2002). Aside from this, it is less the norm that the home situation is 'brought to work' than that the work situation affects the home situation (Frone et al. 1992a; Eagle et al. 1998; Kelloway et al. 1999; Wallace 1999; Kinnunen et al. 2003). The tasks at home are also more flexible (e.g. a home cooked meal can be substituted with a take-away meal) (Gutek et al. 1991). Some exceptions were found to refute this general finding and it is unclear as to whether these exceptions are the result of e.g. the used questionnaires or the study populations (Klitzman et al. 1990; Marks 1998).

### **Male-female differences in WFI**

As the amount of time spent on household chores varies between men and women, differences in WFI can be expected according to sex. The so-called *rational view* states that there is a simple relationship between time spent and the degree of WFI: the more time spent on work, the more  $W \rightarrow FI$  and the more time spent on household chores/caretaking, the more  $F \rightarrow WI$  (Gutek et al. 1991; Duxbury et al. 1994; Kinnunen and Mauno 1998). Because men spend more time on work, it is expected that they experience more  $W \rightarrow FI$  than women. Vice versa, women can be expected to experience more  $F \rightarrow WI$  (Frone et al. 1992b; Duxbury et al. 1994).

In addition to the *rational view*, there is the *gender role perspective* which takes into account the social-cultural roles of men and women (Gutek et al. 1991; Kinnunen and Mauno 1998). This hypothesis states that the more time spent on the non-traditional role, the more WFI occurs: if men spend equal amounts of time on work as well as at doing household chores/caretaking, the more likely they experience more  $F \rightarrow WI$  than women. And if women spend the same amount of time at work outside the home as on work at home, more  $W \rightarrow FI$  occurs than in men. Gutek et al. (1991) and Eagle et al. (1998) found a high but not perfect correlation between the amount of time spent on one domain and the extent of WFI which then occurs. This was therefore only a partial support of the *rational view*. Moreover, Gutek et al. (1991) found only limited indications for the *gender role perspective*: women experience more WFI when equal time is spent on both roles than men. This was also found by Duxbury et al. (1994).

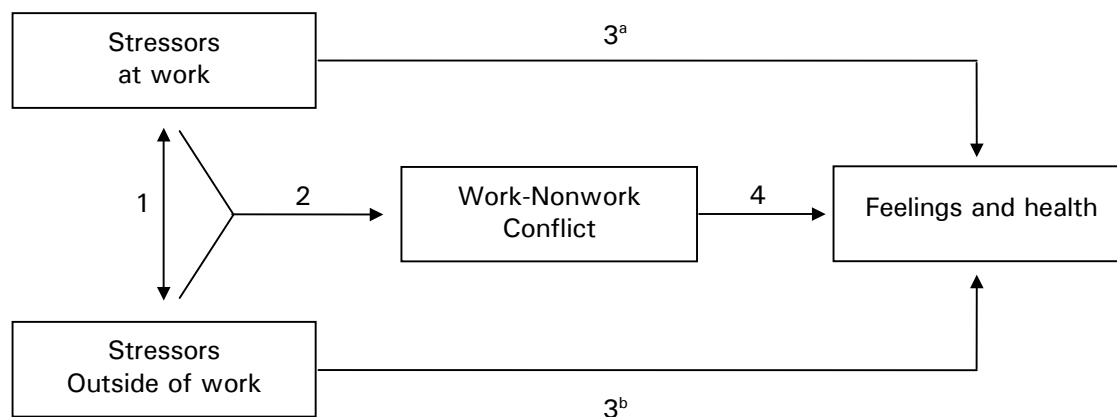
Conclusions concerning sex differences in experiencing WFI are far from clear. No significant differences in  $W \rightarrow FI$  and/or  $F \rightarrow WI$  between men and women were found in

various studies (Loerch et al. 1989; Frone et al. 1992b; Kinnunen and Mauno 1998; Geurts et al. 1999). However, other studies support the idea that men experience more W→FI than women (Wagena and Geurts 2000) and again others support the findings that women experience more W→FI as well as F→WI than men do (Duxbury et al. 1994; Carlson et al. 2000).

### Place in research models

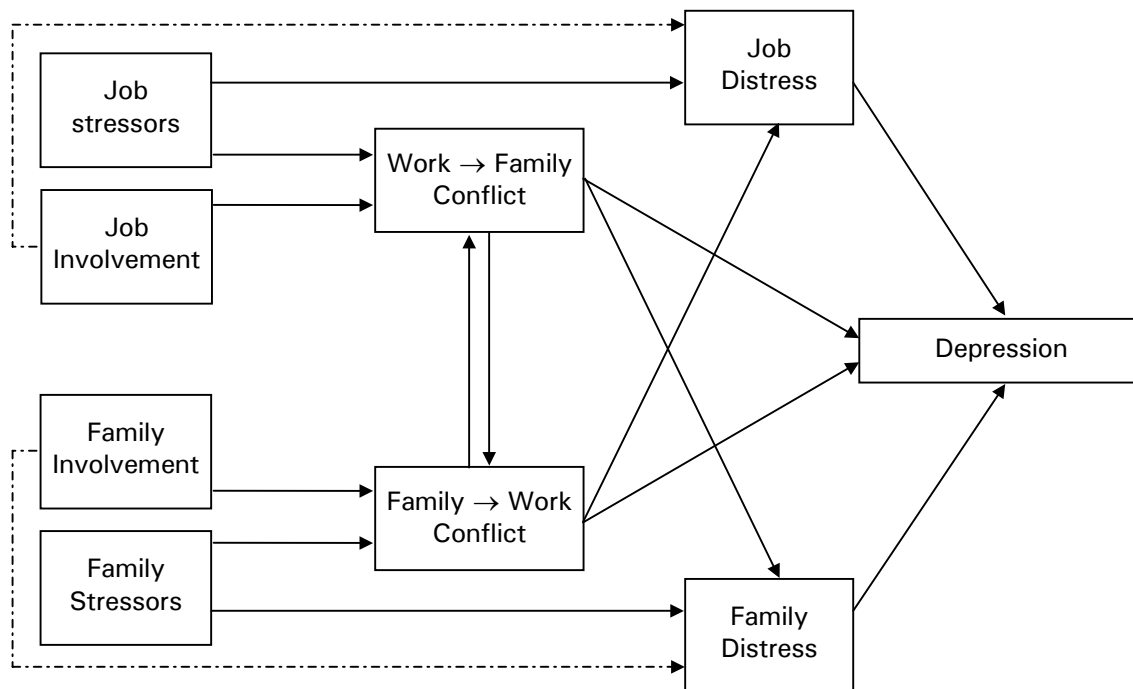
From the literature, it is clear that the place given to WFI within research models can be quite diverse. In some of the studies WFI is seen as a stressor in relationship to outcomes, such as a general feeling of well-being, without further researching what the determinants of WFI are (MacEwen and Barling 1994; Kelloway et al. 1999). In other studies the determinants have been investigated and WFI (in one or more dimensions thereof) is the dependent variable (Greenhaus and Beutell 1985; Greenhaus et al. 1989; Loerch et al. 1989; Greenberger et al. 1989; Gutek et al. 1991; Carlson 1999; Wallace 1999; Cinamon and Rich 2002). However, in most studies WFI is seen as an intermediate variable (Klitzman et al. 1990; O'Driscoll et al. 1992; Parasuraman et al. 1992; Frone et al. 1992a; Kinnunen and Mauno 1998; Carlson and Perrewé 1999; Grandey and Cropanzano 1999; Geurts et al. 1999). This occurs in various ways as shown in the following three example figures.

Figure 1 shows a relatively simple model presented by Klitzman et al. (1990), which shows that there are both direct (arrows 3a and 3b) and indirect (arrows 2 and 4) effects of determinants from work and family life on feelings and health. In this model no particular attention is paid to neither direction nor form of WFI.



**Figure 1** Conceptual framework of the relationships among sources of stress, work-nonworkconflict and feelings and health, derived from Klitzman et al. (1990).

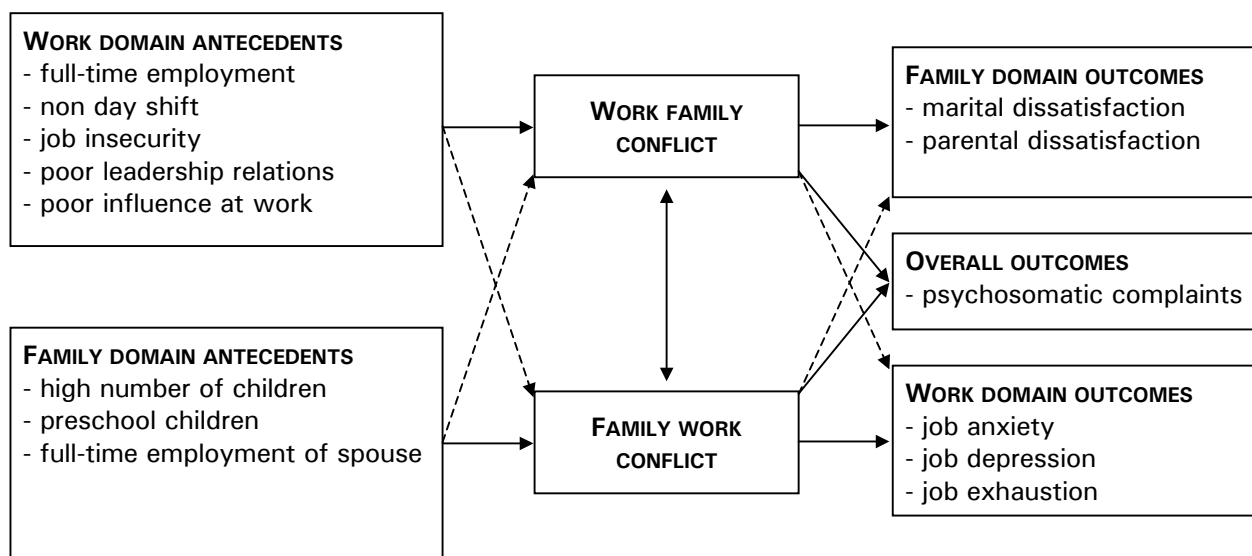
The model presented in Figure 2, derived from Frone et al. (1992a), can be seen as a refinement of that presented in Figure 1. It indicates that work-related determinants affect  $W \rightarrow FI$  and that family-related determinants affect  $F \rightarrow WI$  (Gutek et al. 1991; Netemeyer et al. 1996; Kelloway et al. 1999; Allen et al. 2000; Carlson et al. 2000). Moreover, there is a reciprocal relationship between  $W \rightarrow FI$  and  $F \rightarrow WI$  (Gignac et al. 1996; Kinnunen and Mauno 1998; Aryee et al. 1999). This can be explained as follows: if problems and responsibilities from work interfere with what needs to be done at home ( $W \rightarrow FI$ ), this results in a more stressful situation at home. This in turn affects performance at work and vice versa (Frone et al. 1992a). Frone et al. (1992a) also hypothesized that the effects of  $W \rightarrow FI$  can especially be expected in family life and the effects of  $F \rightarrow WI$  in the work situation (O'Driscoll et al. 1992; Kinnunen and Mauno 1998; Adams and Jex 1999). The rationale behind this is that the quality of life associated with one role is disrupted as a result of the interference of the other role (Frone et al. 1992a).



**Figure 2** Conceptual model of work-family interface according to Frone et al. (1992a). Solid lines represent a positive relation, dotted lines represent a negative relation.

From the recent meta-analysis by Allen et al. (2000) it is clear that  $W \rightarrow FI$  is associated with family-related outcomes, such as marital satisfaction, family satisfaction or life satisfaction. However, there also appear to be associations between  $W \rightarrow FI$  and work-related outcomes, such as intention to turnover and organizational commitment. Kossek and Ozeki (1998) found similar results in their meta-analyses: both  $W \rightarrow FI$  and  $F \rightarrow WI$  are negatively linked to family satisfaction as well as job satisfaction.

When examining theoretical models described in the literature, one seldom sees a deviation from Frone et al. (1992a). Nevertheless, when looking at the results based on the above described meta-analyses, it can be concluded that the model as presented by Frone and colleagues is too limited. In our opinion, a model presented by Kinnunen and Mauno (1998) agrees more to these results. Dotted lines in Figure 3 show these relationships, which are not shown in Figure 2. These relationships are expected to be less strong than the relationships from Frone's et al. model, but still contribute substantially. Kinnunen and Mauno (1998) reported, for example, that the number of children living at home affects both  $F \rightarrow WI$  (as seen in Frone's model) as well as  $W \rightarrow FI$  (which is not seen in their model). Results such as these have been published elsewhere (Klitzman et al. 1990; Netemeyer et al. 1996; Geurts et al. 1999; Wagena and Geurts 2000).



**Figure 3** The model of antecedents and outcomes of work→family conflict and family→work conflict. Solid lines are according to the model of Frone et al. (1992a) and represent stronger assumed paths. The broken lines are added by Kinnunen and Mauno (1998) and represent weaker assumed paths.

Another point of discussion is whether or not the determinants from work and/or family life indirectly lead to (negative) outcomes via WFI or if direct effects are also possible. This may vary for various outcomes. Geurts et al. (1999) reported that they could not find a direct relationship between determinants and the outcomes 'psychosomatic complaints' and 'sleep deprivation' and that only indirect relationships exist via WFI. When considering 'emotional exhaustion' and 'depersonalization', there was a strong mediating role as well as direct effects. Klitzman et al. (1990) reached similar conclusions: there was only a relationship between stressors at work and 'depressive symptoms' via WFI, while there were both direct and indirect relationships between stressors at work and 'physical symptoms'.

## **LIMITATIONS OF THE STUDIES AND RECOMMENDATIONS**

There are various limitations in the studies published until today; the most important ones are discussed below. Recommendations for future studies are also given.

### **Research designs**

Up until now a cross-sectional design has been used most often in research. This, however, limits the possibility of investigating causal connections (Klitzman et al. 1990; Barnett et al. 1992; Frone et al. 1994; Hughes and Galinsky 1994; Frone et al. 1997; Bekker 1999; Allen et al. 2000). The associations found between fulfilling multiple roles, WFI and various outcomes can be a reflection of the strain caused by a role on the outcome, e.g. general feeling of well-being. The opposite, on the other hand, may also be possible: several authors state that a feeling of less satisfaction in either work environment or family situation influences WFI and that this can lead to a downward spiral. Kolk et al. (1995) present us with a comparable example: suffering from chronic headaches can be a result of stressors at work and subsequently negatively influence the experience of the work situation. Aside from this, health can affect finding a partner and having children (Kandel et al. 1985; Waldron and Jacobs 1989; Barnett et al. 1992; Hughes and Galinsky 1994; Kelloway et al. 1999). This is a so-called 'healthy combining effect', which is an alternative for the 'healthy worker effect': only those in good health are capable of combining caretaking and household chores with paid work outside the home (Bekker 1999). Relatively few longitudinal studies have been carried out (MacEwen and Barling 1994; Frone et al. 1997; Grandey and Cropanzano 1999; Kelloway et al. 1999). Longitudinal studies do not completely solve this problem, as in these studies it still applies that ill health affects the number of roles a person can fulfil. Moreover, it is still unclear what a good follow-up period consists of (Frone et al. 1992a; Frone et al. 1997; Kinnunen et al. 2004). Most studies

only take into account two moments of measurement. It is recommended that to design longitudinal research with four or more moments of measurement with relatively short intervals, so that insight into causal relationships can be achieved. With this, it is important to check for confounders, such as age, education level and health at the beginning of the study (Waldron and Jacobs 1989).

### **Self-report questionnaires**

Most studies include a questionnaire. One of the disadvantages of self-reports is that the respondents can be influenced by a negative frame of mind and can therefore report experiencing more conflict between work and family life (Kinnunen and Mauno 1998; Kelloway et al. 1999). In addition, 'common method variance' can occur, which means that respondents have a personal answering style that can colour their answers with respect to both the determinants as well as the outcomes. This can produce marked contrasts, which in turn cause reports of inflated associations. According to various authors the consequences of this type of reporting are minor (Frone et al. 1992a; Hughes and Galinsky 1994).

Even though self-reports have drawbacks, they are unavoidable. From previous studies, it has been shown that the perception of role quality is an important factor (Barnett et al. 1992; Groenendijk 1998). Investigating this aspect can only be done through self-reports such as questionnaires. It would be best, however, if self-report data is combined with biomedical evidence, such as blood pressure or levels of stress hormones (Bekker et al. 1999; Allen et al. 2000). That this is valuable is shown in the following example: fulfilling more than one role can be coupled with a more positive image of one's health. However, negative emotions can be minimized because one would prefer things to be positive. Bekker (1999) calls this the 'super woman or ideal man hypothesis'. Research into psycho-physical measurements shows that (non-perceptible) effects occur when paid work and family responsibilities are combined: women who reported feelings of good health, had less decline in stress hormones after coming home from work than men do, which could be an indication of less possibilities for recovery. Gathering biomedical evidence is, however, much more expensive than self-report questionnaires (Karasek et al. 1987; Bekker et al. 1999).

### **Models**

In this review, we have examined theoretical models regarding WFI. It is apparent that there is still a lot of ambiguity about the relationships between determinants, WFI and outcomes. This can (partly) be explained by the many different measurements used when investigating determinants, WFI and outcomes (Netemeyer et al. 1996; Kossek and Ozeki 1998; Allen et al. 2000; Carlson et al. 2000). As is evident from Figures

1-3, most researchers differentiate between work-related and family-related determinants. Many different types of determinants have been investigated. Determinants that indicate higher load (represented in e.g. the number of hours spent on work or on household chores or as conflict in one of these domains) were most often focused on. Some attention was also paid to positive factors or resources, such as autonomy at work, flexible working hours, childcare and social support both at work and at home. One and the same determinant can, however, be conceptualized differently by different researchers. It falls outside the scope of this review to go into this elaborately and we would refer to Geurts et al. (2002), for example.

It is also true for the outcome measures, that many were investigated with different conceptualizations. Various disciplines have been investigating WFI (Barnett et al. 1992). The choices made, regarding determinants and outcomes, are largely dependent on the background of individual researchers (Gutek et al. 1991). The outcomes related to functioning in the work domain are usually of more interest to management scholars, whereas sociologists usually prefer to examine outcomes related to family domains, and psychologists prefer research into e.g. life satisfaction. Job satisfaction and life satisfaction are those outcomes which are most often studied (Kossek and Ozeki 1998; Allen et al. 2000). Allen et al. (2000) categorised three types of outcomes: work-related, nonwork-related and stress-related outcomes. The first two categories usually receive the most attention. However, the relationships between  $W \rightarrow FI$  and stress-related outcomes, such as burnout, depression, general psychological strain, somatic and physical symptoms proved strongest in their meta-analysis. Therefore, it is recommended to give more attention to those types of outcomes and to take sick leave into consideration as well.

### **Study Populations**

Besides the various research models, it is also plausible that the characteristics of the study populations influence the results of the studies. Many studies have included individuals that are married/living together and/or have at least one child living at home and who are highly educated (Kopelman et al. 1983; Greenhaus et al. 1989; Loerch et al. 1989; Parasuraman et al. 1992; MacEwen and Barling 1994). A number of other studies are about people who are going to school in addition to their paid job (Parasuraman et al. 1992; Adams et al. 1996; Eagle et al. 1998; Adams and Jex 1999; Carlson et al. 2000). These are the groups where it can be expected that they experience WFI. However, singles and those without children can also carry a great amount of responsibility towards parents, other family members and/or friends (Grzywacz and Marks 2000). And even though more and more foreigners and single



parents are working in a paid job, these groups are underrepresented in the study populations (Kossek and Ozeki 1998).

Results from one of the selected groups are not always indicative of the general population, and therefore research into heterogeneous populations is recommended (Burke 1988; Kossek and Ozeki 1998; Wagena and Geurts 2000). This means that study populations should be made up of men and women, with a diversity of occupations, education and income (Allen et al. 2000; Cinamon and Rich 2002). Diversity of occupations and positions is important as these each have specific characteristics which can influence the perception of WFI. For example, working hours can influence how well work and family responsibilities can be combined. A higher income facilitates domestic help, for example, which in turn may result in experiencing less WFI.

Many studies are carried out in the United States. Cultural differences regarding the combination of paid work and family life can be important when comparing results from various studies. Dutch women, for example, more often work at part-time jobs than those in the USA or Sweden (Gjerdingen et al. 2000). Also ideas about parenthood and bringing up children vary from country to country. This means that the results from research carried out in the USA do not necessarily pertain to the situation in the Netherlands. The same is true when comparing results from older studies to more recent ones. Research data gathered twenty years ago are probably no longer very relevant due to all sorts of sociological changes.

### **Lacunae and Perspectives**

A number of measuring instruments used have been validated through explorative and/or confirmative factor analyses (Netemeyer et al. 1996; Stephens and Sommer 1996; Carlson et al. 2000). Nevertheless, as those populations studied are not representative, more validation research is necessary, preferably in heterogeneous groups (Netemeyer et al. 1996; Kossek and Ozeki 1998).

A lot of attention is given to negative spillover in the literature. In order to better understand the value of the compensation model, more attention should be paid to positive WFI (Kinnunen and Mauno 1998; Wagena and Geurts 2000; Grzywacz and Marks 2000). Barnett (1998) reports about positive spillover from work to family domain: mothers with a more challenging job (using their skills, enough complexity) were found to experience less strain with their family responsibilities than mothers with less challenging jobs. Only recently a beginning was made in the development of questionnaire scales to measure positive interference (Barnett et al. 1992; Grzywacz and Marks 2000; Wagena and Geurts 2000).

Many authors recognize that both the forms (time, strain and behaviour) and the directions of WFI ( $W \rightarrow FI$  and  $F \rightarrow WI$ ) are important. It is still unclear though, whether these six dimensions have the same determinants and if they will explain the same outcomes (Carlson et al. 2000). Also indistinct is whether the general conclusion that  $W \rightarrow FI$  rather than  $F \rightarrow WI$  is more often experienced, is valid for all the forms. For suitable measures to be taken and intervention programmes to be set up, it is important to have more insight into these questions (Bruck et al. 2002).

Another matter which has received little attention is the role of personality characteristics (Carlson 1999). There are indications that for example, Type A people are more susceptible to work-related stress even though they prefer to work longer workdays, demand more of themselves and put more value on the importance of work than Type B people. Negative affectivity, ways of coping, neuroticism and extraversion can also be influential (Carlson 1999; Grzywacz and Marks 2000).

Future research could use the above-mentioned points. However, in order to safeguard comparisons with present day literature and to keep in mind practicability, not all aspects can be introduced at once.

## CONCLUSIONS

Many researchers from various disciplines and from different theoretical points of view have spent time and given attention to the effects of combining work with household chores and caretaking since the second half of the previous century. The question of whether combining more roles has a positive or negative effect cannot yet be answered completely, as there has been relatively little research done into health as an outcome of WFI. Moreover, a lot of importance was put onto only the negative aspects. Therefore, it is recommended to investigate more the positive aspects of combining paid work and caretaking, as these have proved to be apparent. Many measuring instruments are used, which hamper comparisons of research results. We have, however, noticed an increase in the fact that more often distinctions are made with reference to direction (work  $\rightarrow$  family and family  $\rightarrow$  work) and form (time, strain and behaviour) of WFI. There are, however, few studies published in which the behaviour-based dimension is taken into consideration. More often there is a call for more uniformity in the conceptualization of WFI. Use of the questionnaire by Carlson et al. (2000) has been propagated.

As more research results are made available, it becomes increasingly clear that the complex models, as presented in Figure 3, are preferable to the simpler models. Comparing studies is very difficult as there were different choices made into researched study populations, determinants and outcomes and the conceptualization

thereof. The plea for more uniformity when conceptualizing the research variables not only applies to WFI but also to the determinants and outcomes. In future research it is also important to give more attention to the study populations: research needs to be done not only into two-salary households with a high social-economic status, but also into singles, single parents, blue collar-workers and foreigners.

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**Work- and family-related characteristics associated  
with six dimensions of work-family interference**

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## ABSTRACT

**Objectives:** The goals of this study were to investigate the relationships of work- and family-related characteristics with both three forms (time, strain and behaviour) and two directions (W→FI and F→WI) of work-family interference. Most authors refer to the model of Frone and colleagues (1992), who have shown work-related characteristics to correlate with W→FI, and family-related characteristics to correlate with F→WI only. There is also some recent evidence showing family-related characteristics to correlate with W→FI and work-related characteristics to correlate with F→WI as well. Kinnunen and Mauno (1998) have included these relationships in their model. In this study we have investigated if evidence can be found in favour of this latter model. Also, we have examined whether the work- and family-related characteristics correlate differently with the six dimensions of WFI. Moreover, we have investigated possible differences between men and women.

**Methods:** A mailed self-report questionnaire was used to gather data from Dutch university employees (N = 1843, response rate: 49.1%). Multiple regression analyses were applied to determine the relationships between the various work- and family-related characteristics and the six WFI subscales with separate analyses on men and women.

**Results:** Various work-related characteristics correlated with W→FI as well as F→WI and various family-related characteristics correlated with F→WI as well as W→FI, which provides support for the model of Kinnunen and Mauno.

**Conclusions:** The six dimensions of WFI can be distinguished, which means that the multidimensionality of WFI should be taken into consideration in future research. Also, differences between men and women were found in the correlations between work- and family-related characteristics and the WFI subscales. Some directions for future research are discussed.

**Keywords:** work-family conflict, men, women, questionnaire



## INTRODUCTION

At the end of the twentieth century, the dual-earner family replaced the traditional breadwinner-homemaker family as the predominant family model (Kinnunen and Mauno 1998; Keuzenkamp and Hooghiemstra 2000; Bruck et al. 2002). The growing diversity of family structures and the increased participation of women with children in the labour force have stimulated considerable research on the relationships between work and family roles (Burke 1988; Stoeva and Chiu 2002).

One major outcome of the inability to balance the demands of work and family is work-family conflict or work-family interference (WFI). According to Greenhaus and Beutell (1985), work-family conflict is 'a form of interrole conflict in which the role pressures from the work and family domains are mutually incompatible in some respect.' An individual often has to perform multiple roles, such as worker, spouse and parent. Adequate performance of these various roles, however, requires time, energy and commitment. The demands of the work-related roles may interfere with the demands of the family-related roles at times and vice versa.

In the past decade, researchers have begun to realize the duality of WFI by considering both work interference with family life (W→FI) and family life interference with work (F→WI) (Gutek et al. 1991; Frone et al. 1992a; Carlson et al. 2000). According to Greenhaus and Beutell (1985), moreover, three forms of WFI can be identified and found to occur in both directions. *Time-based interference* occurs when time spent on activities in one role impedes the fulfilment of responsibilities in another role. *Strain-based interference* occurs when pressures from one role interferes with the fulfilment of the requirement of another role. *Behaviour-based interference* occurs when the behaviour patterns associated with one role cannot be adjusted to be compatible with the behaviour patterns associated with another role.

While many researchers cite the aforementioned definition of WFI, the multidimensionality of WFI has been largely ignored to date (Carlson et al. 2000). Mostly work interference with family (W→FI) has been examined (Allen et al. 2000; Donders et al. 2003b). In addition, attention has been paid to time-based and strain-based interference, with very little attention to behaviour-based W→FI and F→WI (Kelloway et al. 1999).

So far, there is a lack of agreement on a general model for the study of WFI (Kinnunen and Mauno 1998). In 1992, Frone et al. (1992a) stated that the relationships between work- and family-related antecedents, WFI and various outcome measures may be domain-specific. More specifically, they stated that work-related characteristics can contribute to W→FI and thereby influence various family-related outcomes; conversely family-related characteristics can contribute to F→WI and thereby influence various work-related outcomes. In addition, however, Kinnunen and Mauno (1998) have

argued that it is also possible for work-related characteristics to contribute to  $F \rightarrow WI$ , but to a lesser extent than they contribute to  $W \rightarrow FI$ . A similar pattern holds for family-related characteristics and  $W \rightarrow FI$ . In their study, they found a correlation between the number of children living at home and  $W \rightarrow FI$  in both the men and women. A correlation was also found between shift work and  $F \rightarrow WI$  in women. In addition, Wallace (1999) has found significant correlations between family-related variables and both time- and strain-based  $W \rightarrow FI$  in both men and women.

In the present study, we have attempted to extend previous research by exploring the relationships of various work- and family-related characteristics with a multidimensional measure of WFI. Since we examined both three forms and two directions of interference, leading to six dimensions of WFI, it is possible to determine whether the work- and family-related characteristics have different relationships to these six dimensions of WFI. It is important to gain more insight into the possible antecedents because of the potentially adverse effects of WFI on individual's well-being (Loerch et al. 1989).

The study also seeks to examine sex differences in the pattern of correlations. Sex has been shown to be related to WFI and has been controlled for in other studies (Eagle et al. 1997; Carlson 1999). Given the inequity in the division of (paid) work outside the home and work inside the home (e.g. household chores, taking care of children) (Keuzenkamp and Hooghiemstra 2000) and the indications that men and women experience WFI differently (Duxbury et al. 1994; Eagle et al. 1998; Carlson et al. 2000), it is important to investigate these differences in relation to WFI. Therefore, we conducted our analyses on men and women separately.

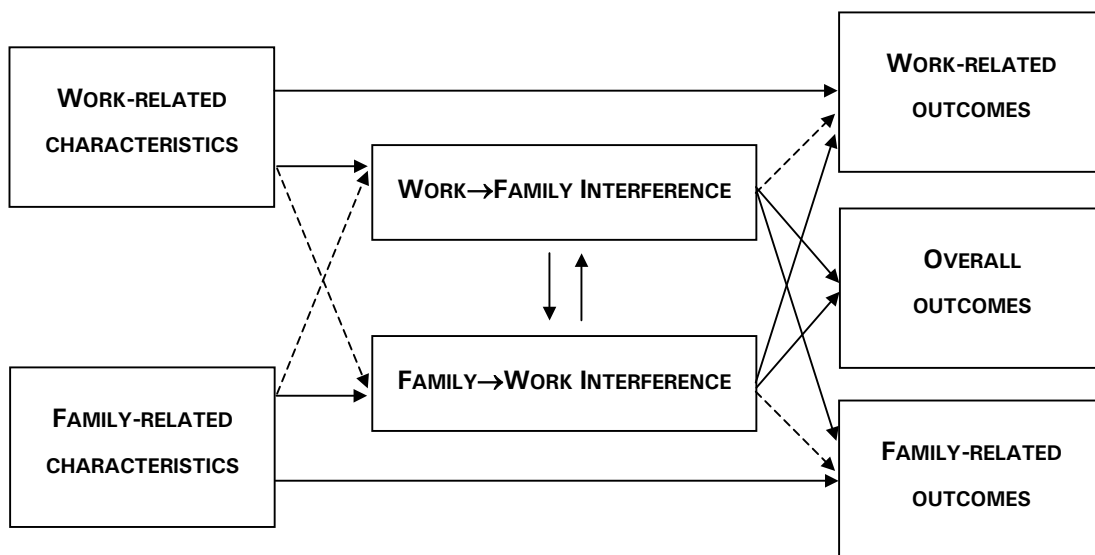
The conceptual model guiding the present study is presented in Figure 1 and is derived from Kinnunen and Mauno (1998). Data were obtained for a heterogeneous work force employed by a Dutch university to examine the relationships between various work-related characteristics, family-related characteristics and WFI. Various outcomes will be considered in subsequent research.

In this study, three particular research topics were considered:

1. Kinnunen and Mauno (1998) have stated that work-related characteristics relate to not only  $W \rightarrow FI$  but also to  $F \rightarrow WI$ . However, the correlations with  $W \rightarrow FI$  can be expected to be stronger than the correlations with  $F \rightarrow WI$ . Similarly, family-related characteristics can be expected to relate more strongly to  $F \rightarrow WI$  than to  $W \rightarrow FI$ . These relationships are presented in a model (Figure 1). We will examine if there is any evidence in our data in favour of this model.
2. On the basis of relevant literature, we expect that work- and family-related characteristics will correlate differentially with the six dimensions of WFI. Work-

related characteristics may include time aspects (e.g. hours worked, flexible work schedule) as well as strain aspects (e.g. low support from superiors or conflicts with colleagues) (Loerch et al. 1989; Kinnunen and Mauno 1998). Similarly, family-related characteristics may include aspects influencing time (e.g. the number and ages of children) and strain aspects (e.g. conflict with family members or low support) (Loerch et al. 1989). For example, it is expected that time aspects correlate more strongly with time-based WFI and that strain aspects correlate more strongly with strain-based WFI. Because behaviour-based WFI is hardly examined, it is difficult to predict what kind of aspects will correlate with these WFI subscales. With the present study, an attempt is made to fill this research gap.

3. Given the traditional differences in the distribution of work and care between men and women, we expect sex differences to occur in the correlations between work-related characteristics, family-related characteristics and the six dimensions of WFI. In general, women are mostly responsible for taking care of the family and the household and men are more involved in (paid) work outside the home (Wallace 1999; Keuzenkamp and Hooghiemstra 2000). In light of these differences, different patterns of correlations can be expected between male and female employees.



**Figure 1** Model derived from Kinnunen and Mauno (1998). The solid lines are in accordance with the model proposed by Frone et al. (1992a); the dotted lines have been added by Kinnunen and Mauno.

## **METHODS**

### **Population**

Data were collected via a questionnaire mailed to the home addresses of all employees at a Dutch university in May-August 2001. By means of an accompanying booklet, the employees were informed about the objectives of the study and the confidential handling of their responses. A pre-addressed, pre-stamped envelope was enclosed for anonymous return of the questionnaire. In order to examine non-response, a card was also enclosed on which the reason for non-response could briefly be indicated. Three weeks after the initial mailing, all the employees were sent a letter of reminder.

A total of 3881 questionnaires was distributed. However, 16 people indicated the receipt of two questionnaires because they had more than one job at the university, 41 questionnaires were returned as undeliverable and 73 persons were no longer employed at the university. A total of 1843 questionnaires proved usable, which means a response rate of 49.1%. Both the University Board and Works Council of the university approved this study. Respondents were not paid for their participation, but completion of the questionnaire during routine work hours was permitted.

### **Questionnaire**

The questionnaire tapped various demographic, work- and family-related characteristics and work-family interference. Mostly we used closed questions, but occasionally (partially) open questions were also used to obtain quantitative data (e.g. number of hours worked weekly, ages of children) or to provide respondents more alternatives than the precoded answers.

#### *Demographic characteristics*

Age was divided into five categories: <25 years (1), 25-35 years (2), 36-45 years (3), 46-55 years (4) and >55 years of age (5). Employment function was categorised as: lower-educated non-scientific personnel (1), higher-educated non-scientific personnel (level of education is college or university degree) (2) or scientific personnel (3). These demographic characteristics were chiefly used as control variables.

#### *Work-related characteristics*

Work-related characteristics were assessed using parts of previously validated Dutch questionnaires: work variety and professional expertise were measured using five-point Likert-type scales derived from the Maastricht Risk Assessment Questionnaire (De Jonge 1994). Work pressure and autonomy were assessed using five-point Likert-type scales from the Maastricht Autonomy Questionnaire (De Jonge et al. 1995; De Jonge et al. 2000). The Questionnaire Organization Stress-D (with four-point Likert-type

scales) was used to assess role conflict, role ambiguity, social support from superiors and social support from colleagues (Bergers et al. 1986). Information on work, communication, possibilities for learning, decision latitude and physical workload were measured using four-point Likert-type scales taken from the Questionnaire on Experience and Evaluation of Work (Van Veldhoven and Meijman 1994; Van Veldhoven and Broersen 1999). Employment terms, career opportunities and unpleasant treatment were assessed using some additional five-point Likert-type scales (Donders et al. 2003a). The item mean for the corresponding category of employment function was substituted for any missing data points that occurred in this part of the questionnaire (mean percentage missing data for the work-related scales: 1.7%). The internal consistency of the scales was moderate to good (Nunnally 1978): Cronbach's alpha of less than 0.70 was only found for work variety, unpleasant treatment, employment terms and career opportunities (Table 1).

Hours worked weekly was asked using an open question and this represents the total numbers of hours worked, including overtime and hours worked in other jobs. A work-related life event meant that the respondent reported the experience of an emotional event within the work situation (e.g. conflict with a colleague or superior, reorganization, changing of jobs, et cetera) and coded as no (0) or yes (1). A four-point scale ranging from never (1) to always (4) was used to ask the extent to which a respondent takes work home.

#### *Family-related characteristics*

A dichotomous measure of marital status was used: married/cohabiting (1) and not married/cohabiting (0). Respondents with a steady relationship, but not cohabiting were categorised as not married/cohabiting.

The age of the youngest child living at home was coded into one of the following six categories: <4 years (1), 4-12 years (2), 13-18 years (3), older than 18 years (4), no children living at home (5) or no children at all (6). These categories correspond with the different school-going ages of children in the Netherlands.

Employment status of the partner was coded into one of three categories: no partner (0), partner is not employed (1) or partner is employed (2). Partner working overtime was coded as yes (1) or no (0). The latter was also coded in cases of no partner. Shift work of the partner was dealt with analogously.

Partner's contribution to household duties and partner's contribution to child care/rearing were examined using questions adapted from Biernat and Wortman (1991). The responses could range from 'my partner does much less than me' (1) to 'my partner does much more than me' (5). In cases of no partner, a code of 0 (=no partner) was assigned.

(Need for) domestic help was assessed using two questions. One question asked whether domestic help was already arranged (yes or no). The second question asked whether domestic help or additional domestic help was needed (yes or no). The combined responses to these questions resulted in four categories: no help, no need (1); no help, need (2); help, no further need (3) and help, additional need (4). The (need for) childcare was assessed in a similar manner and coded into the same four categories, with childless respondents as an extra category (0).

Relationship with the partner was coded as follows: no partner (0); extremely good (1); better than average (2); about average (3); less than average (4); very poor (5). The frequency of conflict/disagreement with the partner was coded as follows: no partner (0); never (1); sometimes (2); regularly (3); often (4); continually (5). Both relationship with the children and conflict/disagreement with the children were assessed and coded in a similar way.

Support from the partner, children and friends/family were assessed using three separate questions with responses, which could range from never (1) to always (4). Cases of single and/or childless respondents were coded not applicable (0).

Family care was defined as taking care of someone outside one's own home and experiencing this as burdensome to some extent (coded as 1). If the provision of family care was not experienced as burdensome to any extent whatsoever, this was coded as no family care (0). More than the usual care for a family member inside the own home was assessed and coded in a similar manner.

A life event in private domain was defined as an emotional event within respondent's private life (e.g. death of the spouse, parent or friend, separation/divorce, moving house, financial problems, et cetera) and coded as no (0) or yes (1). The burden of commuting was coded as: not at all (1); a little (2); fairly (3); or considerably/very much (4).

Relaxation outside work, time pressure outside work and feeling lonely were all assessed along a single four-point scale ranging from never (1) to always (4). Satisfactory social life was coded as: very (1); could be better (2); or not very satisfactory (at all) (3).

### *Work-family interference*

Work-family interference was assessed with the multidimensional measurement developed by Carlson et al. (2000). A professional translator translated the items from English into Dutch. The translations were then discussed by three of the present authors (ND, JF, ERA) and adjusted as necessary (e.g. when the translation was judged too literal, when the initial meaning of the words was lost). The instrument is divided into six subscales: each direction ( $W \rightarrow FI$  and  $F \rightarrow WI$ ) is nested within each of the three forms (time-, strain- and behaviour-based interference). In each subscale

there are three items, yielding a total item count of 18. Responses could range along a five-point scale from strongly disagree (1) to strongly agree (5). Item responses are averaged for each scale, with higher scores indicating more WFI. Missing data (mean percentage: 1.0%) were replaced by the mean item score of the total population. The Cronbach's alphas were all  $\geq 0.80$ , which indicates good internal consistency.

## Analyses

In order to check for selective non-response, the distribution of sex and age found for the respondents was compared to the distribution of these characteristics in a personnel database from the university, using a  $\chi^2$ -test. Pearson correlation coefficients between work-related characteristics and the WFI subscales were next computed.

Differences between the men and women in their work- and family-related characteristics and the six dimensions of WFI were investigated using *Student's t*-tests or  $\chi^2$ -test analyses. Given the large number of respondents, the significance level was set at 0.001 to detect the most relevant differences.

Stepwise linear regression analyses were used to explore the relationships between the work-related characteristics, family-related characteristics and each of the six subscales of WFI, on the men and women separately (Kahane 2001). In one analysis, only the work-related and demographic characteristics were entered at once. In the next analysis, only the family-related and demographic characteristics were entered at once. From these analyses only the proportions of explained variance (determined by  $R^2$ ) are presented (a full overview of the results can be obtained from the first author). Finally, both the work- and family-related characteristics and demographic characteristics were entered at once. The standardised regression coefficients ( $\beta$ ) were used to assess the individual effect of each variable on the WFI subscales. Because of the many low  $\beta$ 's, we will present the regression coefficients  $\geq 0.10$  only.

The data were analyzed using SPSS 9.0.

## RESULTS

### Non-response analysis

Compared to the personnel database, fewer men than women responded ( $\chi^2 = 71.8$ ,  $p < 0.001$ ). A total of 164 persons returned the non-response card and frequently mentioned grounds for non-response were: 'no time to complete the questionnaire' ( $n = 54$ ), 'nothing would be done with the results' ( $n = 18$ ), 'questions are too personal' ( $n = 18$ ), and 'insufficient knowledge of the Dutch language' ( $n = 16$ ).

**Table 1** Correlation matrix for the WFI subscales with the work-related characteristics for the total population (N = 1843). Absolute values of Pearson correlation coefficients >0.08 are significant at 0.001 level. Cronbach's alphas are presented on the diagonal in italics and in parentheses.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1 W→F <sub>time</sub>	(.82)																							
2 F→W <sub>time</sub>	.29	(.80)																						
3 W→F <sub>Istrain</sub>	.46	.27	(.86)																					
4 F→W <sub>Istrain</sub>	.13	.42	.30	(.90)																				
5 W→F <sub>Ibehaviour</sub>	.25	.25	.32	.32	(.84)																			
6 F→W <sub>Ibehaviour</sub>	.18	.22	.31	.29	.77	(.93)																		
7 Unpleasant treatment	.10	.10	.12	.05	.05	.06	(.71)																	
8 Role conflict	.29	.17	.36	.14	.19	.21	.22	(.73)																
9 Work pressure	.44	.19	.40	.01	.17	.14	.12	.43	(.87)															
10 Role ambiguity	.16	.16	.29	.13	.17	.18	.18	.44	.21	(.81)														
11 Physical workload	.09	.03	.18	.08	.04	.04	.12	.20	.13	.06	(.71)													
12 Employment terms	-.30	-.11	-.34	-.06	-.10	-.12	-.16	-.34	-.37	-.29	-.24	(.63)												
13 Work variety	.16	.06	-.01	-.10	.00	-.06	-.03	-.05	.22	-.08	-.19	.11	(.67)											
14 Information on work	-.13	-.13	-.25	-.13	-.13	-.16	-.15	-.42	-.18	-.61	-.14	.30	.19	(.78)										
15 Career opportunities	-.02	.00	-.13	-.06	-.08	-.09	-.12	-.22	-.06	-.17	-.20	.35	.24	.30	(.68)									
16 Communication	-.06	-.09	-.19	-.07	-.10	-.12	-.18	-.32	-.10	-.51	-.10	.32	.19	.51	.26	(.85)								
17 Professional skills	.11	.02	-.05	-.12	.00	-.06	-.04	-.18	.18	-.25	-.14	.12	.41	.30	.26	.21	(.87)							
18 Possibilities for learning	.13	.00	-.11	-.18	-.05	-.11	-.09	-.21	.13	-.23	-.19	.17	.48	.42	.47	.28	.58	(.86)						
19 Decision latitude	.01	-.06	-.19	-.13	-.08	-.13	-.17	-.29	.02	-.48	-.15	.35	.40	.50	.36	.63	.36	.49	(.86)					
20 Autonomy	-.05	.01	-.14	-.06	-.01	-.05	-.06	-.24	-.04	-.16	-.23	.37	.35	.26	.32	.17	.41	.46	.37	(.88)				
21 Social support superiors	-.15	-.10	-.27	-.09	-.14	-.19	-.20	-.52	-.25	-.50	-.11	.32	.10	.48	.27	.47	.15	.28	.51	.18	(.86)			
22 Social support colleagues	-.16	-.13	-.27	-.12	-.19	-.20	-.18	-.40	-.18	-.44	-.08	.26	.09	.41	.20	.38	.16	.24	.39	.15	.46	(.80)		
23 Hours worked weekly	.42	.00	.12	-.10	.06	.01	.02	.14	.33	.05	-.03	-.11	.30	.04	.14	.05	.32	.37	.20	.20	-.07	-.05	(-)	
24 Taking work home	.41	.12	.22	-.12	.12	.06	.05	.15	.44	.08	-.10	-.17	.32	.02	.09	.00	.33	.39	.19	.20	-.10	-.10	.53	(-)



### Descriptive statistics

In Table 1, Pearson correlation coefficients and Cronbach's alphas for the six WFI subscales and the work-related characteristics are presented. Table 2 presents some demographic characteristics. On average, male respondents were older, had a higher level of education and more of them belonged to the scientific personnel compared to the female respondents.

**Table 2** Demographic characteristics of the respondents in percentages.

Characteristic	Total population (N = 1843)	Men (n = 975)	Women (n = 862)
<b>Sex</b>			
Male	53.1	-	-
Female	46.9		
<b>Age *</b>			
< 25 years	5.8	4.3	7.5
26-35 years	27.1	20.6	34.4
36-45 years	27.3	27.0	27.8
46-55 years	27.6	30.3	24.6
> 55 years	12.3	17.9	5.7
<b>Education level *</b>			
Primary school	1.3	.9	1.7
Low vocational school	3.3	3.7	2.8
Lower secondary education	4.7	2.7	7.0
Secondary school	8.5	5.0	12.4
Intermediate vocational school	8.8	7.8	9.9
Higher vocational school	13.9	13.3	14.5
University	59.6	66.6	51.6
<b>Employment function *</b>			
Lower-educated non-scientific personnel	26.6	20.2	33.9
Higher-educated non-scientific personnel	28.3	26.9	29.8
Scientific personnel	45.2	52.8	36.2

\*: Significant differences between men and women,  $p < 0.001$

With regard to the six subscales of WFI, the men reported more  $W \rightarrow FI_{time}$  and  $F \rightarrow WI_{behaviour}$  than women (Table 3<sup>a</sup>). No sex differences were found in the other four subscales. Many sex-related differences were found in the various work-related characteristics (Table 3<sup>a</sup>): the men reported higher work pressure and role conflict than the women. Moreover, the men took work home more often than the women. All of the other significant differences indicate less favourable conditions for the women compared to men (unpleasant treatment, work variety, professional skills, communication, employment terms, career opportunities, possibilities for learning, decision latitude, autonomy).

**Table 3<sup>a</sup>** Mean values and standard deviations (SD) for WFI subscales and work-related characteristics in the men and women.

		Men (n = 975)		Women (n = 862)		t-value	p-value
		Mean	(SD)	Mean	(SD)		
W→FI <sub>time</sub>		2.75	(1.05)	2.50	(.98)	5.33	<.001
F→WI <sub>time</sub>		1.89	(.83)	1.82	(.83)	1.68	.092
W→FI <sub>strain</sub>		2.33	(.94)	2.38	(.95)	-1.12	.265
F→WI <sub>strain</sub>		1.62	(.72)	1.61	(.73)	.22	.830
W→FI <sub>behaviour</sub>		2.52	(.98)	2.37	(.94)	3.41	.001
F→WI <sub>behaviour</sub>		2.52	(.97)	2.46	(.99)	1.32	.189
Negative characteristics							
Unpleasant treatment		1.40	(.15)	1.10	(.23)	-6.00	<.001
Role conflict		1.71	(.45)	1.63	(.42)	4.14	<.001
Work pressure		3.20	(.74)	3.03	(.74)	4.86	<.001
Role ambiguity		2.03	(.58)	2.04	(.59)	-.55	.582
Physical workload		1.54	(.54)	1.59	(.61)	-1.87	.061
Positive characteristics							
Employment terms		3.57	(.73)	3.39	(.73)	5.49	<.001
Work variety		3.41	(.64)	3.14	(.70)	8.55	<.001
Information on work		3.03	(.66)	2.96	(.65)	2.49	.013
Career opportunities		2.78	(.91)	2.65	(.91)	3.29	.001
Communication		2.72	(.67)	2.60	(.65)	3.64	<.001
Professional skills		4.28	(.74)	3.99	(.87)	7.60	<.001
Possibilities for learning		3.06	(.66)	2.81	(.75)	7.65	<.001
Decision latitude		2.77	(.60)	2.55	(.58)	8.03	<.001
Autonomy		3.67	(.65)	3.48	(.76)	5.89	<.001
Social support superior		3.20	(.63)	3.23	(.67)	-.90	.369
Social support colleagues		3.21	(.52)	3.25	(.55)	-1.75	.079
Hours worked weekly		42.84	(10.57)	33.18	(11.13)	18.92	<.001
		n	%	n	%	χ <sup>2</sup>	p-value
Work-related life event	no	868	92.0	747	9.4	1.44	.231
	yes	75	8.0	79	9.6		
Taking home work	never	154	16.0	276	32.4	92.85	<.001
	sometimes	312	32.4	279	32.7		
	often	243	25.2	184	21.6		
	always	255	26.5	113	13.3		

**Table 3<sup>b</sup>** Family-related characteristics of male and female respondents.

		Men		Women		$\chi^2$	p-value
		n	(%)	n	(%)		
Married/cohabiting	no	220	(22.6)	258	(29.9)	12.90	<.001
	yes	755	(77.4)	604	(70.1)		
Age youngest child	< 4 years	119	(12.2)	123	(14.3)	41.13	<.001
	4-12 years	140	(14.4)	113	(13.1)		
	13-18 years	67	(6.9)	65	(7.6)		
	> 18 years	62	(6.4)	35	(4.1)		
	no children living at home	213	(21.9)	107	(12.4)		
	no children	373	(38.3)	417	(48.5)		
Partner's employment status	no partner	219	(22.5)	252	(29.2)	83.26	<.001
	partner not employed	193	(19.9)	48	(5.6)		
	partner is employed	560	(57.6)	562	(65.2)		
Partner on shift work	no	873	(89.9)	783	(91.0)	.685	.408
	yes	98	(10.1)	77	(9.0)		
Partner working overtime	no	890	(92.0)	692	(80.4)	53.22	<.001
	yes	77	(8.0)	169	(19.6)		
Partner's contribution to household duties	no partner	219	(22.6)	252	(29.3)	708.44	<.001
	partner is doing much less	4	(.4)	132	(15.4)		
	partner is doing less	18	(1.9)	217	(25.3)		
	about the same	184	(19.0)	211	(24.6)		
	partner is doing more	280	(28.9)	32	(3.7)		
	partner is doing much more	264	(27.2)	15	(1.7)		
Partner's contribution to child care/rearing	no partner	17	(1.7)	45	(5.2)	452.65	<.001
	partner is doing much less	5	(.5)	50	(5.8)		
	partner is doing less	8	(.8)	139	(6.2)		
	about the same	211	(21.6)	169	(19.7)		
	partner is doing more	222	(22.8)	11	(1.3)		
	partner is doing much more	98	(10.1)	1	(.1)		
	no (resident) children	414	(42.5)	445	(51.7)		
(Need for) domestic help	no help, no need	545	(57.4)	406	(48.3)	33.63	<.001
	no help, need	144	(15.2)	215	(25.6)		
	help, no further need	196	(20.6)	151	(18.0)		
	help, additional need	65	(6.8)	68	(8.1)		
(Need for) childcare	no children	373	(38.7)	417	(48.7)	49.45	<.001
	no childcare, no need	436	(45.2)	253	(29.6)		
	no childcare, need	22	(2.3)	19	(2.2)		
	childcare, no further need	111	(11.5)	131	(15.3)		
	childcare, additional need	23	(2.4)	36	(4.2)		
Relationship with partner	no partner	152	(15.8)	166	(19.3)	9.11	.105
	extremely good	416	(43.2)	361	(42.0)		
	better than average	241	(25.1)	186	(21.1)		
	average	130	(13.5)	130	(15.1)		
	worse than average	22	(2.3)	13	(1.5)		
	very poor	1	(.1)	3	(.3)		
Conflict/disagreement with partner	no partner	152	(15.7)	166	(19.3)	15.41	.004
	never	122	(12.6)	69	(8.0)		
	sometimes	619	(63.9)	538	(62.7)		
	regularly	66	(6.8)	72	(8.4)		
	continually	9	(.9)	13	(1.5)		

Table 3<sup>b</sup> (Continued)

		Men		Women		$\chi^2$	p-value
		n	(%)	n	(%)		
Relationship with children	no children	373	(38.4)	417	(48.9)	36.82	<.001
	extremely good	290	(29.8)	261	(30.6)		
	better than average	195	(20.1)	95	(11.1)		
	average or worse	114	(11.7)	80	(9.4)		
Conflict/disagreement with children	no children	373	(38.4)	417	(48.8)	43.63	<.001
	children are too young	83	(8.5)	92	(10.8)		
	never	139	(14.3)	71	(8.3)		
	sometimes	345	(35.5)	229	(26.8)		
	regularly/ continually	31	(5.5)	45	(5.3)		
Support from partner	no partner	166	(17.2)	165	(19.4)	4.77	.189
	never/sometimes	97	(10.1)	69	(8.1)		
	often	252	(26.1)	200	(23.6)		
	always	449	(46.6)	415	(48.9)		
Support from children	no children/too young	551	(57.0)	599	(70.3)	46.55	<.001
	never	48	(5.0)	20	(2.3)		
	sometimes	145	(15.0)	70	(8.2)		
	often	146	(15.1)	89	(10.4)		
	always	76	(7.9)	74	(8.7)		
Support from friends and families	never	56	(5.8)	22	(2.6)	72.18	<.001
	sometimes	296	(30.8)	164	(19.3)		
	often	368	(38.3)	308	(36.3)		
	always	242	(25.2)	354	(41.7)		
Family care outside home	no	915	(93.8)	782	(90.7)	6.35	.012
	yes	60	(6.2)	80	(9.3)		
Family care inside home	no	921	(94.5)	828	(96.1)	2.55	.110
	yes	54	(5.5)	34	(3.9)		
Life event in private domain	no	647	(68.6)	455	(55.1)	34.30	<.001
	yes	296	(31.4)	371	(44.9)		
Burden of commuting	not at all	698	(72.2)	589	(68.6)	9.70	.021
	a little	200	(20.7)	180	(47.4)		
	fairly	42	(4.3)	41	(4.8)		
	considerably/very much	27	(2.8)	48	(5.6)		
Relaxation outside work	never	56	(5.8)	37	(4.4)	1.95	.582
	sometimes	325	(33.7)	291	(34.3)		
	often	432	(44.9)	386	(45.5)		
	always	150	(15.6)	134	(15.8)		
Time pressure outside work	never	314	(32.6)	299	(35.1)	4.53	.210
	sometimes	391	(40.6)	360	(42.3)		
	often	209	(21.7)	153	(18.0)		
	always	50	(5.2)	40	(4.7)		
Feeling lonely	never	564	(58.5)	460	(54.0)	4.82	.185
	sometimes	317	(32.9)	322	(37.8)		
	often	72	(7.5)	61	(7.2)		
	always	11	(1.1)	9	(1.1)		
Satisfactory social life	very	352	(36.3)	362	(42.3)	7.05	.029
	could be better	523	(53.9)	420	(49.1)		
	not very satisfactory (at all)	95	(9.8)	73	(8.5)		

Many differences were found between the men and women with regard to the family-related characteristics (Table 3<sup>b</sup>). Some of these differences stem from the differences in the ages: men were generally older and therefore had older children than the women. The data showed the 'traditional' inequities in the distribution of working hours, child-care tasks and household chores: men work more hours outside the home, while women take care of children and the household more often than men.

### **Research topic 1: The models of Frone et al. (1992a) vs. Kinnunen and Mauno (1998)**

Our first research topic concerns possible domain-specific relationships between the work-related characteristics, family-related characteristics and the WFI subscales. Entry of the work-related characteristics, age and employment function into the different regression equations shows these characteristics to contribute more to the explanation of  $W \rightarrow FI_{\text{time}}$  and  $W \rightarrow FI_{\text{strain}}$  than to the explanation of  $F \rightarrow WI_{\text{time}}$  and  $F \rightarrow WI_{\text{strain}}$  (Table 4). Entry of family-related characteristics, age and employment function into the regression equations shows  $W \rightarrow FI_{\text{time}}$  to be better explained by these characteristics than  $F \rightarrow WI_{\text{time}}$ . Similar results are found for  $W \rightarrow FI_{\text{strain}}$  versus  $F \rightarrow WI_{\text{strain}}$  and  $W \rightarrow FI_{\text{behaviour}}$  versus  $F \rightarrow WI_{\text{behaviour}}$  (Table 4).

Combined entry of both the work- and family-related characteristics explains more of the variance in especially  $W \rightarrow FI_{\text{time}}$  and  $W \rightarrow FI_{\text{strain}}$  when compared to entry of the different blocks separately, in both men and women (Table 4). This means that there are unique significant contributions of family-related characteristics to the explanation of these  $W \rightarrow FI$  subscales. These results are in favour of the model of Kinnunen and Mauno (1998), indicating that not only work-related characteristics but also family-related characteristics correlate with  $W \rightarrow FI$  subscales. The other four subscales are best explained the family-related characteristics (Table 4). The explained variances using the final models are not much higher than the explained variances using family-related characteristics only. However, in Table 5 can be seen that there are significant correlations regarding the work-related characteristics as well as correlations regarding the family-related characteristics.

Recapitulating our results, it can be said that the relationships between the work- and family-related characteristics and the WFI subscales are more complex than proposed by Frone et al. (1992a).

### **Research topic 2: Differential patterns of correlations**

Comparison of the models presented for the three  $W \rightarrow FI$  subscales in Table 5 shows different patterns of correlations. For example, the strongest regression coefficients for  $W \rightarrow FI_{\text{time}}$  are found for relaxation outside work, hours worked weekly and work pressure (in men only) (Table 5). Relaxation outside work and work pressure also

correlate strongly with  $W \rightarrow FI_{\text{strain}}$ , but so do role conflict (in men only), role ambiguity (in women only) and feeling lonely.  $W \rightarrow FI_{\text{behaviour}}$  is chiefly explained by the relations with one's partner and children. Also, a significant correlation with social support from colleagues is found in the women.

Similar differences are found when the models presented for the three forms of  $F \rightarrow WI$  are inspected. The age of the youngest child has a strong correlation with  $F \rightarrow WI_{\text{time}}$ . Time pressure outside work (in men), (need for) childcare and family care outside the home (in women) also correlate with  $F \rightarrow WI_{\text{time}}$ , but to a lesser extent. In contrast, most of the family-related characteristics, which correlate with  $F \rightarrow WI_{\text{strain}}$  reflect the relations with family members. Experiencing a life event in the private domain is associated with more  $F \rightarrow WI_{\text{strain}}$ . Taking work home is associated with less  $F \rightarrow WI_{\text{strain}}$ . While the results for  $F \rightarrow WI_{\text{behaviour}}$  are comparable to those for  $F \rightarrow WI_{\text{strain}}$ , the work-related characteristics that correlate with  $F \rightarrow WI_{\text{behaviour}}$  are dissimilar to those that correlate with  $F \rightarrow WI_{\text{strain}}$ .

In addition to the dissimilar regression models found for the various WFI subscales, the total proportions of explained variance are also found to vary (Table 4). The preceding results thus provide evidence for the concept of six different dimensions of WFI.

**Table 4** Percentages of explained variance for the six WFI subscales by blocks of work- and family-related characteristics (age and employment function were also entered simultaneously into the regression equations; M = Men, W = Women).

	$W \rightarrow FI_{\text{time}}$		$F \rightarrow WI_{\text{time}}$		$W \rightarrow FI_{\text{strain}}$		$F \rightarrow WI_{\text{strain}}$		$W \rightarrow FI_{\text{behaviour}}$		$F \rightarrow WI_{\text{behaviour}}$	
	M	W	M	W	M	W	M	W	M	W	M	W
Work-related characteristics	34	28	7	9	31	24	4	5	8	7	7	10
Family-related characteristics	30	26	13	21	28	27	12	17	19	14	13	11
Work- and family-related characteristics	43	38	16	24	42	35	16	19	21	16	14	17

**Table 5** Final regression models with the six WFI subscales as outcomes. Only standardised regression coefficients  $\geq .10$  are presented (M = men, W = women).

	W→FI <sub>time</sub>		F→WI <sub>time</sub>		W→FI <sub>strain</sub>		F→WI <sub>strain</sub>		W→FI <sub>behaviour</sub>		F→WI <sub>behaviour</sub>	
	M	W	M	W	M	W	M	W	M	W	M	W
Negative characteristics of work												
Role conflict					.10				.13			.16
Work pressure	.25				.24	.21					.10	
Role ambiguity						.11						
Positive characteristics of work												
Employment terms	-.12				-.12							-.12
Work variety												
Possibilities for learning							-.13					
Social support colleagues					-.11							
Hours worked weekly (all jobs + overtime)									-.11			-.10
Taking work home	.22	.27					-.14	-.18				
Family-related characteristics		.12										
Age youngest child			-.22	-.19								
(Need for) childcare				.19			.17		.16		.17	
Poor relationship with partner								.13	.17	.19		.12
Many conflicts/disagreements with partner								.15		.12		
Poor relationship with children												.16
Many conflicts/disagreements with children							-.16	-.15	-.21	-.22	-.13	-.15
Support from partner								-.16			-.12	-.15
Support from children												
Support from family/friends												
Providing family care				.10								
Life event in private domain							.11	.18				
Relaxation outside work				-.11			-.17				-.12	
Time pressure outside work	-.24	-.25	.12		-.26	-.30						
Feeling lonely					.18	.10	.11					
Satisfactory social life									.12			.13
Age												.10
Employment function												

Shaded cells indicate correlations expected on the basis of the model formulated by Frone et al. (1992a).

### Research topic 3: Differences between men and women

Clear differences between the men and women were found in all of the regression models. The proportions of explained variance by the final model (i.e. work- and family-related characteristics entered simultaneously) of the three forms of  $F \rightarrow WI$  were all higher in the women than in men, while the proportions of explained variance of the three forms of  $W \rightarrow FI$  were all higher in the men than in the women (Table 4). The sex difference was particularly marked for the two time-based WFI subscales. The regression results in Table 5 also show different patterns in the men and women. For example, in men significant correlations were found between work pressure and employment terms, on the one hand, and  $W \rightarrow FI_{time}$ , on the other hand, whereas in women taking work home correlates with  $W \rightarrow FI_{time}$ . In women, characteristics that reflect the relations with family correlated more often with  $F \rightarrow WI_{strain}$  or  $F \rightarrow WI_{behaviour}$  than in men.

## DISCUSSION

In the present study we explored the correlations between work-related characteristics, family-related characteristics and six dimensions of work-family interference in the men and women employed by a Dutch university.

### Research topic 1

The results with regard to the domain-specific relationships between the various work-related characteristics, family-related characteristics and the WFI subscales show the relationships to be more complex than proposed by Frone et al. (1992a). According to these authors work-related characteristics correlate with  $W \rightarrow FI$  and family-related characteristics correlate with  $F \rightarrow WI$ . In later research, Kinnunen and Mauno (1998) suggested that the relationships could be expanded and that work-related characteristics may thus correlate with  $F \rightarrow WI$  and family-related characteristics with  $W \rightarrow FI$  as well. The results of our study provide evidence in favour of the model of Kinnunen and Mauno (1998).

In other studies, correlations according to the model of Kinnunen and Mauno (1998) have been also found (Geurts et al. 1999; Wallace 1999). For example, Geurts et al. (1999) reported a correlation between the family-related characteristic 'overtime partner' and  $W \rightarrow FI$ . However, their explanation of this finding was that they did not take the bi-directional nature of WFI into consideration and that this particular correlation was an indirect correlation via  $F \rightarrow WI$ . We also did not consider the reciprocal relationship between the three forms of  $W \rightarrow FI$  and the three forms of  $F \rightarrow WI$  in our analyses, but Table 1 shows most of the correlation coefficients with regard to



the WFI subscales to be rather low, with the exception of the coefficient between  $W \rightarrow FI_{\text{behaviour}}$  and  $F \rightarrow WI_{\text{behaviour}}$ . According to Loerch et al. (1989), low intercorrelations between the WFI subscales justify analysis without the inclusion of the reciprocal relationship between the WFI subscales.

## Research topic 2

According to the description of WFI provided by Greenhaus and Beutell (1985), three forms (time, strain and behaviour) and two directions (from work to family and from family to work) of interference can be distinguished. The results of the present study confirm this assumption with different proportions of variances explained for the six subscales of WFI (Table 4) and different patterns of correlations between work-related characteristics, family-related characteristics and the WFI subscales (Table 5). The results of other studies suggest that time-based characteristics correlate more strongly with time-based interference and strain-based characteristics with strain-based interference (Loerch et al. 1989; Kinnunen and Mauno 1998) and we found similar results. However, our results also show some characteristics to correlate with several WFI subscales: work pressure correlates with  $W \rightarrow FI_{\text{time}}$  in men and with  $W \rightarrow FI_{\text{strain}}$  in both men and women, for example. Apparently, work pressure contains not only a time component but also a strain component. Similarly, relaxation outside work correlates with almost every WFI subscale considered in this study. Because we formulated this question ourselves, it is not quite sure how valid this question is.

Behaviour-based WFI is often omitted from studies, chiefly because it is difficult to operationalize (Kelloway et al. 1999). Compared to time- and strain-based WFI, we found lower proportions of explained variance in both  $W \rightarrow FI_{\text{behaviour}}$  and  $F \rightarrow WI_{\text{behaviour}}$ . Moreover, both  $W \rightarrow FI_{\text{behaviour}}$  and  $F \rightarrow WI_{\text{behaviour}}$  correlated the most with family-related characteristics. Loerch et al. (1989) found a significant correlation between family conflict and behaviour-based WFI but with 45% and 27% of the total variance in  $WFI_{\text{behaviour}}$  explained in the men and women, respectively. These proportions of explained variance are much higher than those found in our study, even though we included more potential antecedents in our analyses. Different questions were used to assess WFI with the direction of WFI not taken into consideration in the study by Loerch et al. (1989), however and also another population was studied. This complicates the comparison of the study results.

To our knowledge, the questionnaire developed and used by Carlson et al. (2000) has only been used in one other study in addition to ours (Bruck et al. 2002). The three studies show work and family boundaries to be asymmetrically permeable (Frone et al. 1992b; Wallace 1999): that is, the levels of  $W \rightarrow FI_{\text{time}}$  and  $W \rightarrow FI_{\text{strain}}$  were higher than their  $F \rightarrow WI$  counterparts, while no significant differences between  $W \rightarrow FI_{\text{behaviour}}$  and

$F \rightarrow WI_{\text{behaviour}}$  were found. Behaviour-based WFI has not been the topic of extensive study and its prevalence is therefore still unknown (Wallace 1999). Given that the formulation of questions to assess behaviour-based interference in a valid manner appears to be difficult, it may be that the questions as initially formulated by Carlson et al. (2000) are in need of adjustment.

### Research topic 3

In most studies of WFI, sex is treated as a confounder (e.g. Klitzman et al. 1990) and important differences between men and women may therefore be missed. The results of our study indeed show clear differences in the patterns of WFI between men and women. The levels of  $W \rightarrow FI_{\text{time}}$  and  $F \rightarrow WI_{\text{behaviour}}$  are higher in men than in women. Using the same instrument, Carlson et al. (2000) report significant sex differences for  $F \rightarrow WI_{\text{time}}$ ,  $W \rightarrow FI_{\text{strain}}$ ,  $F \rightarrow WI_{\text{strain}}$  and  $F \rightarrow WI_{\text{behaviour}}$  but with women consistently showing higher means than men. In general, results with regard the level of WFI in men and women appear to be ambiguous. In some studies, more WFI is found in women (Duxbury et al. 1994; Carlson et al. 2000) while in other studies more WFI is found in men (Eagle et al. 1998; Wagena and Geurts 2000); and in other studies no differences are reported whatsoever (Eagle et al. 1997).

We found clearly different patterns of correlations in the men and women. In addition, the proportions of explained variance for the three forms of  $W \rightarrow FI$  in this study were found to be higher in men than in women, while the total proportions of explained variance for the three forms of  $F \rightarrow WI$  subscales were found to be higher in the women than in the men. These findings clearly reflect the 'traditional' division of social roles. Many women (and men) in Western societies believe that being a wife and raising a family is the number one priority for women with financial independence and career advancement coming second. Men, in contrast, are seen to be predominantly as breadwinners and providers for the family (Gutek et al. 1991; Wallace 1999; Cinamon and Rich 2002; Nelson and Burke 2002). However, men are increasingly fulfilling various family roles in addition to the traditional work role, while women assign growing importance to a work role and financial independence in addition to their family roles (Cinamon and Rich 2002). Eagle et al. (1997) explained the lack of significant differences in the levels of WFI found in their study in terms of greater cooperation among couples with men gradually taking on more household duties and possibly experiencing the pressures of combining work and family roles to a greater extent. In future research, it may be interesting to take into account the ratings of importance for various work and family roles from the perspectives of respondents and their partners.

### Some methodological considerations

The net response in this study was 49.1%, which is comparable with response rates found in other studies on this topic (e.g. Gutek et al. 1991; Kelloway et al. 1999; Bruck et al. 2002). The non-response analyses showed a selective response: 55% of the eligible women returned the questionnaire while 41% of the men did. We have some indications that women are particularly interested in this research topic and are probably therefore more willing to complete the questionnaire. With the aid of the non-response card, we tried to gain some insight into the reasons for non-response. However, only 8% of the subjects who were not willing to complete the questionnaire returned this non-response card. On the other hand, in an analytical study such as the present one, it is more important to have sufficient variance instead of a perfectly representative population (Kristensen 1995). Although some family-related characteristics, such as e.g. providing family care and additional care for an inmate were unbalanced, we believe that in general there was enough variance in our data.

Comparison of our results with those of other authors is difficult because very different variables have often been included and even variables with the same label or name have not been measured the same (Kossek and Ozeki, 1998). The respondents in most studies are also only those living with at least one person (i.e. partner and/or child) (Schieman et al. 2003). In this study, single people were included as well. In addition, we examined a greater number of variables than other researchers on average. Often only negative work-related characteristics as role conflict and role ambiguity have been included while we also included positive characteristics as decision latitude, social support and work variety. However, these positive characteristics do not correlate very highly with the different WFI subscales.

As in many other studies, we divided the research variables into antecedents (i.e. work- and family-related characteristics) and outcome measures (i.e. WFI subscales). Given that the present study was cross-sectional, however, the causal relationships between the different variables cannot be determined. For instance, relaxation outside work strongly correlated with five WFI subscales and was construed as an antecedent of WFI. It is very possible, however, for insufficient relaxation outside work to be a consequence of WFI (either originating from work or from home). One is simply not able to relax sufficiently outside one's work. Additional to the cross-sectional design, another limitation of this study was the use of self-report measures, which could be liable to bias.

The proportions of explained variance were lower for the three forms of F→WI than for the three forms of W→FI. These differences were presented as evidence for the existence of six different –but related– dimensions of WFI. However, this may also partially be explained by differences in measurement. The questions used to assess the

work-related characteristics were of a largely subjective nature while the questions used to assess the family-related characteristics were of a more objective nature. For example, we asked the respondents about the division of household chores and the care for children, but not about their satisfaction regarding this division. Additionally, it is possible that misclassification occurred, because the family-related responses concerned with the partner and/or children were coded in such a manner that the absence of a partner and/or a child was considered least burdensome. However, not having children or being single can be very stressful as well.

Finally, there is some question with regard to the generalisability of our findings. Although a rather broad spectrum of occupational types and levels was represented within our sample, the subject population was rather highly educated and the working conditions within a university are known to be good (Donders et al. 2003a). Most research on WFI has been based on samples in Western countries, especially the United States (Aryee et al. 1999). Our study was situated in the Netherlands and the Dutch labour market obviously differs from that in other countries. For example, female labour force participation started relatively late and is still rather low in the Netherlands when compared to e.g. Sweden or the United States (Gjerdingen et al. 2000). The percentage of Dutch women employed on a part-time basis is also considerably higher than in other industrialised Western countries. Furthermore, most Dutch parents believe that care for the children is their responsibility and not the responsibility of others. It is only during the past few years that the use of professional day care facilities has become socially accepted and, as a result of this, professional childcare is still in its infancy and not as well organized as in e.g. the Scandinavian countries.

### **Further research**

As noted in the Introduction, the focus of the present study was on the relationships between work-related characteristics, family-related characteristics and the six WFI dimensions. Relationships to various stress-related outcome measures were not considered. However, such outcome variables are part of the general model of WFI. Structural equation modelling should be undertaken in future research to examine the full model.

## CONCLUSIONS

We found evidence in favour of the model of Kinnunen and Mauno (1998) as opposed to the model of Frone et al. (1992a)

The concept of WFI proposed by Carlson et al. (2000) appears to be reasonably valid. Based on the correlations with various work- and family-related characteristics, the six dimensions could indeed be distinguished.

There are clear sex differences in the patterns of correlation for the work-related characteristics, family-related characteristics and the six WFI subscales. In light of the different social roles in men and women, the conduct of separate analyses in men and women is clearly recommended.

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**Does combining work and family issues form a risk factor for sick leave?  
Antecedents and outcomes of work-family interference  
in Dutch university employees**

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## ABSTRACT

**Objectives:** Aims were to test an extensive model to determine work- and family-related antecedents of work→family interference (W→FI) and family→work interference (F→WI) as well as associations with fatigue, emotional exhaustion, perceived health complaints and sick leave. In addition, differences between men and women were investigated. **Methods:** A questionnaire on work- and family-related characteristics, work-family interference, health-related characteristics and sick leave was sent to all employees at a Dutch university (N=1843; response rate: 49.1%). Structural equation modelling was used to calculate associations between the antecedents, W→FI, F→WI, fatigue, emotional exhaustion, perceived health complaints and sick leave. **Results:** Work pressure and satisfaction with employment terms were more strongly associated with W→FI in the men than in the women, whereas age of the youngest child was more strongly associated with F→WI in the women than in the men. In both sexes, W→FI had a strong effect on fatigue, emotional exhaustion and perceived health complaints and an indirect effect (through perceived health complaints) on sick leave. F→WI was weakly and negatively associated with emotional exhaustion in the women. The results regarding sick leave showed that in both sexes perceived health complaints, a life event in private domain, (need for) childcare and the presence of chronic disease played important direct roles. In addition, a work-related life event contributed to the explanation of sick leave in the men, whereas support from the children seemed to protect the women from sick leave. **Conclusions:** Work-family interference, especially W→FI, contributed largely to the explanation of health-related characteristics in both sexes. There were considerable differences in the associations of work- or family-related antecedents, W→FI, F→WI and ill health between the men and women. It is recommended to take sex differences into consideration in intervention programmes order to reduce work-family interference.

**Keywords:** Work-family interference, family-work interference, fatigue, sick leave, men, women

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## INTRODUCTION

The number of people who combine paid work and family activities is increasing in most Western societies. The present working population contains more single parents and also larger numbers of dual-earner families, chiefly because of the growing participation of women in the labour market (Keuzenkamp and Hooghiemstra 2000; Duyvendak and Stavenuiter 2004). In addition, the dividing line between work and private life is fading, because of the 24-hour society, work being more mentally (instead of physically) demanding and advancing technical facilities that make it easier to work at home, e.g. teleworking (Burke 1988; Geurts et al. 1999; Jansen 2003).

Owing to these changes, interest in work-family issues, especially work-family interference, has grown over the past few decades. Work-family interference (WFI) is defined as 'a form of interrole 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.' (Greenhaus and Beutell 1985). Research has found evidence to support this reciprocal situation, in that work can interfere with family life (W→FI) and family life can interfere with work (F→WI). W→FI and F→WI are generally considered to be distinct, but related, constructs (Frone et al. 1992; Netemeyer et al. 1996; Allen et al. 2000). Within each direction, three forms (time-, strain- and behaviour-based interference) can also be distinguished (Greenhaus and Beutell 1985; Carlson et al. 2000). Most researchers regard WFI as a mediator in the relationship between work- and family-related characteristics and various outcome measures, such as well-being and health (Frone et al. 1992; O'Driscoll et al. 1992; Carlson and Perrewé 1999; Geurts et al. 1999). This means that WFI can be placed in the causal path between antecedents and outcomes. Consequently, antecedents are not only directly related to outcomes, but also indirectly related through WFI.

Various antecedents of WFI have been described in the literature. Work-related characteristics, such as work pressure, role conflict and role ambiguity, are expected to increase the perception of WFI (Greenhaus and Beutell 1985; Greenhaus et al. 1989; Geurts and Demerouti 2003). Attention has also been paid to several facilitating characteristics, such as autonomy at work, flexible working hours, onsite childcare and social support (Greenhaus and Beutell 1985; Geurts and Demerouti 2003; Jansen 2003). These 'positive' characteristics (or job resources) are expected to decrease the perception of WFI. Family-related characteristics often include marital status, the number and age of the children living at home, family role conflict and family role ambiguity (Greenhaus and Beutell 1985; Loerch et al. 1989; Eagle et al. 1998; Geurts and Demerouti 2003). In some studies, (statistically) significant relationships were found between various antecedents and WFI, whereas other studies did not observe

these relationships. It is therefore difficult to conclude which antecedents are the most important. This lack of consistency can partly be explained by different operationalisations of the WFI construct throughout the literature and by the way antecedents have been assessed (Kossek and Ozeki 1998; Allen et al. 2000; Donders et al. 2003b). In addition, different sets of antecedents and different study populations have been used, which makes it difficult to compare study results.

Various outcome measures have also been described. Allen et al. (2000) presented a comprehensive review of outcomes associated with  $W \rightarrow FI$ . They grouped the outcomes into three categories: 'work-related' (e.g. job satisfaction, organisational commitment, intention to turnover, job performance, career satisfaction, career success), 'nonwork-related' (e.g. life satisfaction, marital satisfaction, family satisfaction, family performance, leisure satisfaction) and 'stress-related' outcomes (e.g. general psychological strain, somatic/physical symptoms, depression, substance use, burnout, work-related stress, family-related stress). To the best of our knowledge, sick leave has scarcely been used as an outcome measure. Allen et al. (2000) located two studies that examined the relationship between  $W \rightarrow FI$  and absenteeism (Goff et al. 1990; Thomas and Ganster 1995). Goff et al. (1990) reported that perceiving more  $W \rightarrow FI$  was related to more absenteeism. However, Thomas and Ganster (1995) were unable to find associations between WFI and absenteeism, due to lack of variance in the outcome measure. In addition to these two studies, other studies demonstrated relationships between  $F \rightarrow WI$  and absenteeism, but not between  $W \rightarrow FI$  and absenteeism (Gignac et al. 1996; Eagle et al. 1997). Besides absenteeism due to personal illness, the measure of absenteeism always included partial absenteeism, such as arriving late and leaving early (Goff et al. 1990) or the number of interruptions at work of at least 20 minutes (Gignac et al. 1996).

More recently, Jansen (2003) has studied antecedents and consequences of WFI in a large Dutch population. On the basis of cross-sectional analyses, it was concluded that a general nondirectional measure of WFI was related to more need for recovery and more fatigue in both sexes. Cross-sectional analyses also showed that high levels of  $W \rightarrow FI$  and  $F \rightarrow WI$  were associated with more sickness absence. In the men, higher  $F \rightarrow WI$  was associated with a shorter time to onset of the first sickness spell. In the women, these relationships were in the expected direction, but failed to reach statistical significance. Unfortunately, in this study, the relationships with work- and family-related characteristics were controlled for. Therefore, nothing was mentioned about possible antecedents of sick leave, other than  $W \rightarrow FI$  and  $F \rightarrow WI$  (Jansen 2003).

As mentioned above, there is evidence that (both directions of) WFI are associated with health-related outcomes, such as burnout (O'Driscoll et al. 1992; Allen et al. 2000), perceived health complaints (Geurts et al. 1999) and fatigue (Jansen 2003). In

addition, these health-related outcomes may be potential precursors of sick leave (De Croon 2003; Jettinghoff et al. 2004; Roskes et al. 2005). The purpose of the present study was to use structural equation modelling to empirically evaluate the relationships between antecedents (viz. various work-related and family-related characteristics), work-family interference and health-related characteristics (viz. fatigue, emotional exhaustion, perceived health complaints and sick leave) in a heterogeneous population of Dutch university employees. To the best of our knowledge, this is the first attempt to investigate the intervening role of WFI in a bi-directional nature ( $W \rightarrow FI$  and  $F \rightarrow WI$ ) in a model that includes both antecedents and outcomes of WFI, with sick leave as one of the main outcome measures.

### Conceptual model

A conceptual model, presented in Figure 1, guided this study. We based our conceptual model on several models described in the field of occupational health and work-family interference.

In occupational health research into the relationship between (psychosocial) workload, well-being and health, the Job Demand Model developed by Karasek (1979) has frequently been used. Johnson and Hall (1988) extended the model with a third dimension, into the Job Demand Control Support model. This model predicts that the combination of high job demands, low job decision latitude and low social support have the most negative consequences on a person's health.

In the research field of WFI, the model proposed by Frone et al. (1992) is frequently referred to. They were among the first to take the bi-directional nature of WFI into account: the distinction between  $W \rightarrow FI$  and  $F \rightarrow WI$ . In addition, domain-specific relationships have been proposed: work-related antecedents can contribute to  $W \rightarrow FI$  and thereby influence various family-related outcomes; conversely, family-related antecedents can contribute to  $F \rightarrow WI$  and thereby influence various work-related outcomes. The arrows in Figure 1 indicated with '1' correspond with these hypotheses. In contrast, Kinnunen and Mauno (1998) argued that it is possible for work-related antecedents to contribute to  $F \rightarrow WI$ , but to a lesser extent than they contribute to  $W \rightarrow FI$ . A similar pattern holds true for family-related antecedents and  $W \rightarrow FI$ . The arrows in Figure 1 indicated with '2' correspond with these supplementary hypotheses.

Several studies showed that WFI plays a mediating role (Bacharach et al. 1991; Frone et al. 1992; Geurts et al. 1999). This means that work- and family-related characteristics may have direct relationships with various outcomes as well as indirect relationships through WFI. Therefore, it is hypothesized that antecedents are related to both WFI and outcomes.

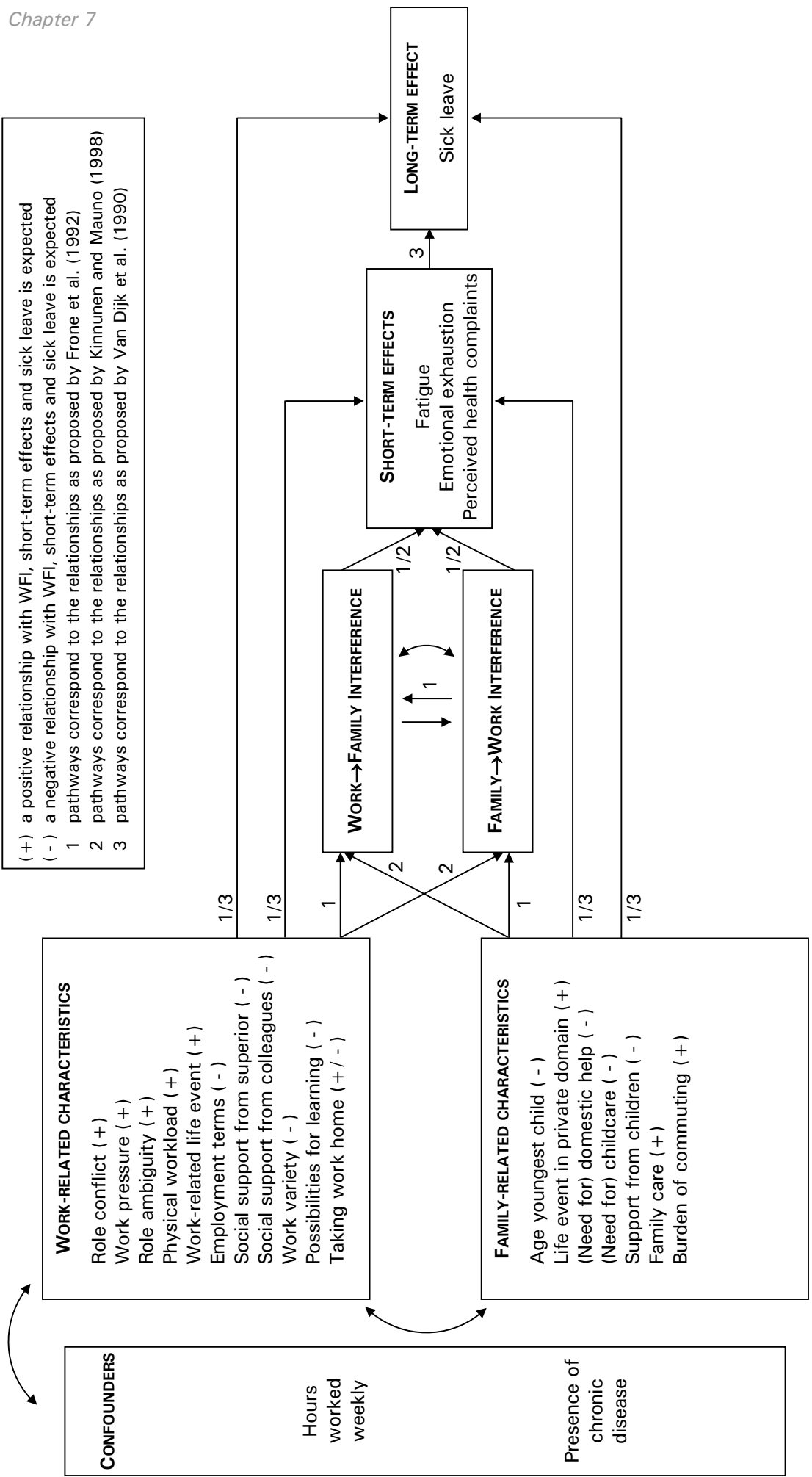


Figure 1 The conceptual model of antecedents and outcomes of work-family interference.

The Dutch literature describes a variation of the Job Demand Control Support model, called the model 'Workload' (Van Dijk et al. 1990). In this model, distinction is made between short-term and long-term health effects. On the basis of previous (Dutch) studies, it has been concluded that health outcomes seem to be important determinants of sick leave (De Croon 2003; Jettinghoff et al. 2004; Roskes et al. 2005). In this study, the short-term effects comprised three health-related characteristics, viz. fatigue, emotional exhaustion and perceived health complaints, while the long-term effect was sick leave.

### **Sex differences**

In the past, many research into WFI only paid attention to women (Barnett et al. 1992), but nowadays it is believed that work-family issues also apply to men (Thomas and Ganster 1995). Many researchers have hypothesized that women experience more WFI than men because they typically have greater responsibilities at home and more saliency to family roles. However, empirical evidence showed mixed results regarding sex differences in WFI. In some studies, no sex differences were found (Frone et al. 1992; Kinnunen and Mauno 1998; Geurts et al. 1999), whereas in other studies, sex differences were present (Duxbury et al. 1994; Eagle et al. 1998; Carlson et al. 2000; Jansen 2003). These differences applied to the level of WFI as well as to the strength of the associations between antecedents, WFI and outcomes. For example, Eagle et al. (1998) reported that their male respondents were experiencing more  $W \rightarrow FI$  and strain-based  $F \rightarrow WI$ . Moreover, although the men were experiencing the same amount of time-based  $F \rightarrow WI$  as the female respondents, the relationship with absenteeism tended to be stronger in the men than in the women.

There are many differences in the work, family and health situations between men and women. In many (Western) countries, there is inequity in the division of (paid) work outside the home and work inside the home (e.g. household chores, care for children) (Gjerdingen et al. 2000; Keuzenkamp and Hooghiemstra 2000). In general, men are socialized to be the breadwinner, whereas the family domain is considered to be a more central domain for women (Geurts et al. 2003). Although the labour participation of women has increased considerably in the past few decades, the participation of men in household and child care tasks has increased to a much smaller extent. Consequently, women's total workload has become greater (Gjerdingen et al. 2000).

Generally, women experience more ill health than men (Geurts et al. 1999; McDonough and Walters 2001). Sex differences in health outcomes and sick leave may be explained by differences in work situation and family life. As mentioned above, women are assumed to have a higher total workload, which is probably

detrimental to their health and can lead to sick leave. On the other hand, women may be absent more often than their male colleagues because of the traditional family responsibilities assigned to women: it is generally the wife who cares for a sick child (Eagle et al. 1997).

In short, there are many differences regarding work and family issues between men and women. It is important to take these differences into consideration when exploring the relationships between antecedents, WFI and health outcomes. Therefore, all our analyses were conducted on men and women separately.

### **Research questions**

The aims of this study were to investigate the relationships between antecedents, WFI and health-related outcomes. More specifically our research questions were:

- What are the significant antecedents of  $W \rightarrow FI$  and  $F \rightarrow WI$ ?
- What are the relationships of the work-related characteristics, family-related characteristics and WFI with the health-related characteristics and sick leave?
- Are there differences in study variables and in associations between antecedents, WFI and health-related outcomes between men and women?

## **METHODS**

### **Population**

Data were collected via a questionnaire mailed to the home addresses of all employees at a Dutch university in May-August 2001. By means of an accompanying booklet, the employees were informed about the objectives of the study and the confidential handling of their responses. A pre-addressed, pre-stamped envelope was enclosed for the anonymous return of the questionnaire. In order to examine non-response, a card was also enclosed on which the reason for non-response could briefly be indicated. Three weeks after the initial mailing, all the employees were sent a letter of reminder.

A total of 3881 questionnaires was distributed. However, 16 people indicated the receipt of two questionnaires because they had more than one job at the university, 41 questionnaires were returned as undeliverable and 73 persons were no longer employed at the university. A total of 1843 questionnaires proved ultimately usable, which means a response rate of 49.1%. The University Board and the Works Council of the university approved this study. No payment was made for participation, but completion of the questionnaire was permitted during routine working hours.

## Questionnaire

The questionnaire tapped various work- and family-related characteristics, work-family interference, health-related characteristics and sick leave. Mostly we used closed questions, but occasionally (partially) open questions were also used to obtain quantitative data (e.g. hours worked weekly, age of the children) or to provide the respondents with more alternatives than the precoded answers. The variables described below were selected for inclusion in our structural equation model (see section 'Analyses'). More details about other variables in the questionnaire have been presented elsewhere (Donders et al. *submitted*).

### *Work-related characteristics*

Work-related characteristics were assessed using parts of previously validated Dutch questionnaires: work variety was measured using a five-point Likert-type scale (three items) derived from the Maastricht Risk Assessment Questionnaire (De Jonge 1994). Work pressure was assessed using a five-point Likert-type scale (eight items) from the Maastricht Autonomy Questionnaire (De Jonge et al. 1995; De Jonge et al. 2000). The Questionnaire Organization Stress-D (with four-point Likert-type scales) was used to assess role conflict, role ambiguity, social support from superiors and social support from colleagues (all these scales comprised five items) (Bergers et al. 1986). Possibilities for learning (four items) and physical workload (three items) were measured using four-point Likert-type scales taken from the Questionnaire on Experience and Evaluation of Work (Van Veldhoven and Meijman 1994; Van Veldhoven and Broersen 1999). Satisfaction with employment terms was assessed using a five-point Likert-type scale (5 items) (Donders et al. 2003a). The small number of respondents with missing data (mean percentage: 1.7%) on work-related items were assigned the mean item score for the corresponding category of employment function. The internal consistency of the scales was moderate to good (Nunnally 1978): Cronbach's alpha of less than 0.70 was only found for work variety and employment terms.

A work-related life event (an emotional event within the work situation, e.g. conflict with a colleague or superior, reorganization, changing jobs, et cetera) was coded as no (0) or yes (1). A four-point scale that ranged from never (1) to always (4) was used to assess the extent to which a respondent took work home. Hours worked weekly were assessed with an open question on the (average) total number of working hours, including overtime and hours worked at other jobs. The answers were divided into three categories: <25 hours (1), 25-40 hours (2) and >40 hours (3). This variable was used as a potential confounder.

### *Family-related characteristics*

The age of the youngest child living at home was coded into one of the following six categories: <4 years (1), 4-12 years (2), 13-18 years (3), >18 years (4), no children living at home (5) or no children at all (6). These categories correspond with the different school-going ages of children in the Netherlands.

(Need for) domestic help was assessed using two questions. One question asked whether domestic help was already present (yes or no). The second question asked whether domestic help or additional domestic help was needed (yes or no). The combined responses to these questions resulted in four categories: no help, no need (1); no help, need (2); help, no further need (3) and help, additional need (4). The (need for) childcare was assessed in a similar manner and coded into the same four categories, with childless respondents as an extra category (0).

Support from the children was assessed using one question with responses that could range from never (1) to always (4). Childless respondents and respondents with very young children were coded as not applicable (0).

Providing family care was defined as more than usual care of a family member inside one's own home and experiencing this as burdensome (coded as 1). If the provision of such care was not experienced as burdensome to any extent whatsoever, this was coded as no family care (0).

A life event in private domain was defined as an emotional event within a respondent's private life (e.g. death of the spouse, parent or friend, separation/divorce, moving house, financial problems, et cetera) and coded as no (0) or yes (1).

The burden of commuting was coded as: not at all (1); a little (2); fairly (3); or considerably/very much (4).

### *Work-family interference*

Work-family interference was assessed using the multidimensional measurement developed by Carlson et al. (2000). A professional translator translated the items from English into Dutch. The translations were then discussed by three of the authors (ND, JF, ERA) and adjusted as necessary (e.g. when the translation was judged too literal, when the initial meaning of the words was lost). The instrument is divided into six subscales: each direction (W→FI and F→WI) is nested within each of the three forms (time-, strain- and behaviour-based interference). In most studies, behaviour-based interference was omitted (Kelloway et al. 1999) and time- and strain-based interference were taken together in one measure (e.g. Goff et al. 1990; Thomas and Ganster 1995; Kinnunen et al. 2004). Therefore, we also chose this approach. Work→family interference (W→FI) was assessed using the three W→FI<sub>time</sub> items and the three W→FI<sub>strain</sub> items. The three F→WI<sub>time</sub> items and the three F→WI<sub>strain</sub> items



were used to assess F→WI. Responses could range from strongly disagree (1) to strongly agree (5) (Carlson et al. 2000).

Missing data (mean percentage: 1.0%) were replaced by the mean item score of the total population. Next, the item responses were averaged: higher scores indicated more WFI. Cronbach's alphas were 0.84 and 0.83 for W→FI and F→WI, respectively. This indicated good internal consistency (Nunnally 1978).

#### *Health-related characteristics and sick leave*

Based on the model 'Workload' (Van Dijk et al. 1990), the health-related characteristics were divided into short- and long-term effects (Figure 1). The short-term effects comprised fatigue, emotional exhaustion and perceived health complaints. Fatigue (four items) was assessed using the Shortened Fatigue Questionnaire (Alberts et al. 1997; Boot 2004). Emotional exhaustion was measured using four items adapted from the Dutch version of the Maslach Burnout Inventory (De Jonge et al. 2000). Perceived health complaints were measured using the VOG-13 that includes 13 dichotomous items that assess whether a person occasionally suffers from a range of psychosomatic complaints (Dirken 1969; Geurts et al. 1999).

Sick leave is considered to be a long-term effect. In a previous study on this data set, Roskes et al. (2005) have used three measures of sick leave. The dichotomous variable general sick leave was based on the question 'Have you taken sick leave because of health problems in the past 12 months?' (yes or no). Open questions were posed with regard to the frequency and duration of sick leave during the past 12 months. Given our interest in sick leave due to health problems, sick leave due to pregnancy (n=16) or accidents / sport injuries (n=19) was categorised as no sick leave. Frequent sick leave was defined as more than two episodes of sick leave during the past 12 months, regardless of the duration. Prolonged sick leave was defined as the sum of all sick leaves that occurred during the past 12 months longer than two weeks. The above-mentioned measures were recoded into one variable 'sick leave'. Respondents who had not taken sick leave were classified as 'no sick leave' (0). Respondents with  $\leq 2$  episodes and  $\leq 2$  weeks in total of sick leave were classified as 'low sick leave' (1). Respondents with  $> 2$  episodes and  $\leq 2$  weeks and respondents with  $> 2$  weeks of sick leave were classified as 'high sick leave' (2).

The presence of chronic disease is used as a potential confounder (Kolk et al. 1995; Jansen 2003; Roskes et al. 2005). More details about this study variable are presented elsewhere (Roskes et al. 2005). The presence of chronic disease was coded as no (0) or yes (1).

## Analyses

### *Descriptive statistics and intercorrelations*

To check for selective non-response, the distribution of sex and age in the respondents was compared to the distribution of these characteristics in a personnel database from the university, using  $\chi^2$ -tests. Differences in study variables between the men and women were investigated using  $\chi^2$ -tests and *Student's t*-tests. Also, Pearson correlation coefficients were calculated. Given the large number of respondents, the significance level for these tests was set at 0.001 to detect the most relevant differences and correlations.

### *Preliminary analyses to select the most relevant variables*

In a previous study on this data set, we have used a variety of explanatory variables (Donders et al. *submitted*). However, in this study, we decided to select the most relevant study variables, to reduce the complexity of our model. Thus, multiple stepwise linear regression analyses were performed on the men and women separately using SPSS 12.0. Four blocks of antecedents were formed:

- *Negative work-related characteristics*: unpleasant treatment, role conflict, work pressure, role ambiguity, physical workload, taking work home and a work-related life event. A higher score on these characteristics was expected to correlate with a higher score on the WFI subscales and health-related characteristics.
- *Positive work-related characteristics*: employment terms, work variety, information on work, career opportunities, communication, professional skills, possibilities for learning, decision latitude, autonomy, social support from superiors and social support from colleagues. A higher score on these characteristics was expected to correlate with a lower score on the WFI subscales and health-related characteristics.
- *Family-related characteristics that reflected demands*: married/cohabiting, age of the youngest child; work status of the partner, partner on shift work, partner working overtime, poor relationship with the partner, conflict/disagreement with the partner, poor relationship with the children, conflict/disagreement with the children, family care inside the home, family care outside the home, life event in private domain, burden of commuting. A higher score on these characteristics was generally expected to correlate with a higher score on the WFI subscales and health-related characteristics. An exception was age of the youngest child, because of the way it was coded; it is hypothesized that respondents with children in the youngest age group will have more WFI and sick leave and report higher scores on the three health-related characteristics.

- *Family-related characteristics that reflected supportive elements:* (need for) domestic help, (need for) childcare, support from the partner, support from the children, support from friends/family, contribution of the partner to household duties, contribution of the partner to child care/rearing. A higher score on these characteristics was expected to correlate with a lower score on the WFI subscales and health-related characteristics.

In the first step of the preliminary analyses, each of these blocks was entered separately into six regression equations, with  $W \rightarrow FI$ ,  $F \rightarrow WI$ , fatigue, emotional exhaustion, perceived health complaints and sick leave as dependent variables. Variables were selected that had an absolute standardised regression coefficient of  $\geq 0.10$  in one of the six equations, either in the men or women (Cohen 1977). In the next step, these selected variables were entered simultaneously into regression equations, again with the six aforementioned dependent variables and in the men and women separately. This time, the potential confounders age, employment function, hours worked weekly and the presence of chronic disease were also included. Again, variables were selected that had an absolute standardised regression coefficient of  $\geq 0.10$  in one of the six equations, either in the men or women. However, only one absolute standardised regression coefficient of  $\geq 0.10$  was found for age, partner working overtime, conflict/disagreement with the partner and poor relationship with children. Therefore, these variables were dropped from further analyses. The study variables included in the analyses are described in the section 'questionnaire'.

### *Structural equation modelling*

The relationships in the model of selected antecedents, WFI and outcomes were tested with structural equation modelling using maximum likelihood estimation as implemented in LISREL 8.54 (Jöreskog and Sörbom 1996). Structural equation modelling enables all the relationships in the model to be tested simultaneously and also takes into account direct and indirect effects. Testing of the model was based on the original covariance matrices of the male and female respondents. We used LISREL's capacity for multi-sample analysis, so separate models were obtained for the male and female respondents and differences in the structural parameters could be tested between the men and women (Gignac et al. 1996; Jöreskog and Sörbom 1996).

We treated the multi-item scales as a single item indicator of each construct and corrected for random measurement error by setting the error variance of each construct equal to the product of its variance and one minus the estimated reliability of each construct (Frone et al. 1992; Kline 1998).

In the first model (Model A), all the work- and family-related characteristics were related to the two WFI subscales, the three short-term health-related characteristics and sick leave.  $W \rightarrow FI$  and  $F \rightarrow WI$  were related to fatigue, emotional exhaustion and perceived health complaints, but not to sick leave. Fatigue, emotional exhaustion and perceived health complaints were related to sick leave.

For each fixed parameter, the modification index is a measure of predicted decrease in  $\chi^2$  if a single parameter is relaxed and the model is reestimated. The fixed parameter corresponding to the largest index is the one that, when relaxed, will improve the fit of the model maximally (Jöreskog and Sörbom 1996). Based on these modification indices, covariances between the disturbances of fatigue, emotional exhaustion and perceived health complaints were made free (Model B). This is in accordance with our expectations that the three health-related characteristics are related to each other (Donders et al. 2003a).

Based on the model proposed by Frone et al. (1992) we expected a reciprocal relationship between  $W \rightarrow FI$  and  $F \rightarrow WI$ . Also, covariance between the disturbances was expected, because these measures may share common causes that are not explicitly modelled (Frone et al. 1992). The modification indices of these three parameters were high; therefore, these parameters were the next to be set free. However, it was only possible to set one of these parameters free, because otherwise, several model parameters could not be identified. We chose to relax the covariance between the disturbances (Model C).

The next step was to make the model more parsimonious. If the relationship between two variables was not significant ( $t$ -value  $\geq 1.96$ ) in either the men or the women, this parameter was constrained to be zero. This was done until the parameter was significant in at least one of the sexes. The modification indices were checked regularly and when a modification index of  $\geq 3.84$  was found for a given parameter, this particular parameter was set free again. At the end of our analyses, the parameters were significant in one of the sexes and all the modification indices in the beta and gamma matrix were  $< 3.84$  (Final model). The proportions of explained variance by the explanatory variables were estimated by squared multiple correlations for reduced form (Jöreskog 1999).

To investigate differences in associations between various study variables between the men and women, we constrained the parameter in the women to equal the freely estimated parameter in the male respondents. This was conducted for every parameter separately. If the  $\chi^2$  difference ( $df = 1$ ) between the freely estimated model and the constrained model was  $\geq 3.84$ , there was a significant difference (at 0.05 level) in the structural parameter between the men and women.

## RESULTS

### Non-response analysis

Compared the personnel database, fewer men than women responded ( $\chi^2 = 71.8$ ,  $p < 0.001$ ). A total of 164 persons returned the non-response card and frequently mentioned grounds for non-response were: 'no time to complete the questionnaire' ( $n = 54$ ), 'nothing would be done with the results' ( $n = 18$ ), 'questions are too personal' ( $n = 18$ ), and 'insufficient knowledge of the Dutch language' ( $n = 16$ ).

### Descriptive statistics and differences in study variables

Table 1 presents some demographic characteristics. On average, the male respondents were older, had a higher level of education and more of them belonged to the scientific personnel compared to the female respondents.

Mean values of study variables showed that the men were experiencing more role conflict, higher workpressure, more satisfaction with employment terms, work variety and possibilities for learning (Table 2). They took work home more often than the women. Results for the family-related characteristics showed that more of the women faced a life event in their private domain in the past 12 months. The men reported more support from the children, but the difference could also partly be explained by more childless women. More of the women worked  $< 25$  hours per week, whereas more of the men worked  $> 40$  hours. The women experienced more fatigue and perceived health complaints and had taken more sick leave than the men. The Pearson correlation matrix indicated that the magnitude of the correlations between the study variables were generally low to moderate (Table 3). Exceptions were the correlations between the age of the youngest child and (need for) childcare ( $-0.85$  and  $-0.90$  in men and women, respectively) and correlations between fatigue, emotional exhaustion and perceived health complaints (correlations ranged from  $0.52$  to  $0.70$ ).

**Table 1** Demographic characteristics of the respondents in percentages.

	Total population		Men		Women		$\chi^2$
	N	%	n	%	n	%	p-value
Age							
< 25 years	105	5.8	41	4.3	64	7.5	< .001
25-35 years	490	27.1	196	20.6	294	34.4	
36-45 years	494	27.3	257	27.0	237	27.8	
46-55 years	498	27.6	288	30.3	210	24.6	
> 55 years	219	12.3	170	17.9	49	5.7	
Education level							
Primary school	24	1.3	9	.9	15	1.7	< .001
Low vocational school	60	3.3	36	3.7	24	2.8	
Lower secondary education	86	4.7	26	2.7	60	7.0	
Secondary school	156	8.5	49	5.0	107	12.4	
Intermediate vocational school	161	8.8	76	7.8	85	9.9	
Higher vocational school	254	13.9	129	13.3	125	14.5	
University	1092	59.6	648	66.6	444	51.6	
Employment function							< .001
Lower-educated non-scientific personnel*	488	26.7	197	20.2	291	33.9	
Higher-educated non-scientific personnel*	518	28.3	262	26.9	256	29.8	
Scientific personnel	825	45.1	514	52.8	311	36.2	

\*: Higher-educated = higher vocational school or university; lower-educated = all other educations.

**Table 2** Mean values and standard deviations (SD) of the study variables in the men and women separately.

	Range / Categories	Mean (SD)		<i>t</i> -value	p-value
		Men (n = 975)	Women (n = 862)		
Role conflict <sup>a</sup>	1-4	1.71 (.45)	1.63 (.42)	4.14	<.001
Work pressure <sup>a</sup>	1-5	3.20 (.75)	3.03 (.74)	4.86	<.001
Role ambiguity <sup>a</sup>	1-4	2.03 (.58)	2.04 (.59)	-.55	.582
Physical workload <sup>a</sup>	1-4	1.54 (.54)	1.59 (.60)	-1.87	.061
Work-related life event <sup>a,c</sup>	0 = no 1 = yes	.08 (.27)	.10 (.29)	-1.19	.223
Employment terms <sup>b</sup>	1-5	3.57 (.73)	3.39 (.73)	5.49	<.001
Social support superiors <sup>b</sup>	1-4	3.20 (.63)	3.23 (.67)	-.90	.369
Social support colleagues <sup>b</sup>	1-4	3.21 (.52)	3.25 (.55)	-1.75	.079
Work variety <sup>b</sup>	1-5	3.41 (.64)	3.14 (.70)	8.55	<.001
Possibilities for learning <sup>b</sup>	1-4	3.06 (.66)	2.81 (.75)	7.65	<.001
Taking work home <sup>a,c</sup>	1 = never 4 = always	2.62 (1.04)	2.16 (1.02)	9.56	<.001
Age youngest child <sup>a,c</sup>	1 = < 4 years 6 = no children	4.26 (1.85)	4.33 (1.96)	-.73	.468
Life event in private domain <sup>a,c</sup>	0 = no 1 = yes	.31 (.46)	.45 (.50)	-5.88	<.001
(Need for) domestic help <sup>b,c</sup>	1 = no help, no need 4 = help, additional need	1.77 (1.00)	1.86 (.98)	-1.89	.059
(Need for) childcare <sup>b,c</sup>	0 = no children 1 = no childcare, no need 4 = childcare, additional need	.94 (1.04)	.97 (1.23)	-.55	.583
Support from children <sup>b,c</sup>	0 = no children 1 = never 4 = always	1.12 (1.42)	.85 (1.40)	4.06	<.001
Family care <sup>a,c</sup>	0 = no 1 = yes	.06 (.23)	.04 (.19)	1.61	.107
Burden of commuting <sup>a,c</sup>	1 = not at all 4 = considerably/very much	1.38 (.70)	1.47 (.83)	-2.66	.008
Hours worked weekly <sup>a,c</sup>	1 = < 25 hours 3 = > 40 hours	2.41 (.58)	1.92 (.67)	16.59	<.001
Presence of chronic disease <sup>a,c</sup>	0 = no 1 = yes	.24 (.43)	.26 (.44)	-1.11	.269
W→FI <sup>a</sup>	1-5	2.54 (.85)	2.44 (.83)	2.58	.010
F→WI <sup>a</sup>	1-5	1.75 (.65)	1.72 (.66)	1.18	.237
Fatigue <sup>a</sup>	4-28	11.85 (6.37)	13.24 (6.78)	-4.54	<.001
Emotional exhaustion <sup>a</sup>	1-5	2.51 (.97)	2.51 (.95)	.18	.986
Perceived health complaints <sup>a</sup>	0-13	2.47 (2.52)	3.04 (2.54)	-4.82	<.001
Sick leave <sup>a,c</sup>	0 = no sick leave 2 = high sick leave	.69 (.72)	.87 (.77)	-5.23	<.001

<sup>a</sup>: On these variables, a higher score or category is considered as unfavourable.

<sup>b</sup>: On these variables, a higher score or category is considered as favourable.

<sup>c</sup>: These variables are categorical, more details about some categories are presented in section DISCUSSION.

**Table 3** Pearson correlation matrix (above the diagonal women, below the diagonal men). Correlation coefficients with absolute values of  $\geq .10$  are significant at the 0.001 level.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1 Role conflict		.41	.50	.19	.14	-.34	-.50	-.34	.01	-.19	.19	.02	.03	.12	.00	-.07	.03	.05	.12	.00	.37	.15	.29	.45	.25	.14	
2 Work pressure		.42		.24	.14	.11	-.44	-.27	-.17	.23	.15	.45	-.04	-.01	.21	.06	-.03	.01	.06	.29	.02	.43	.10	.29	.48	.21	.05
3 Role ambiguity		.39	.18		.04	.14	-.26	-.52	-.45	-.02	-.15	.16	.07	.09	.04	-.03	-.15	.04	.03	.14	-.02	.30	.16	.26	.38	.25	.14
4 Physical workload		.22	.14	.07		.00	-.21	-.08	-.05	-.21	-.19	-.07	.11	-.04	-.09	-.08	.03	.00	.01	.13	.14	.02	.20	.18	.29	.15	
5 Work-related life event		.09	.08	.13	.02		-.06	-.12	-.09	.04	.06	.12	.04	.03	.05	-.02	-.05	-.03	.03	.10	.04	.12	.00	.10	.18	.11	.08
6 Employment terms		-.37	-.34	-.30	-.26	-.10		.34	.23	.03	.08	-.29	-.08	-.01	-.04	.05	.04	.03	-.06	-.19	-.03	-.35	-.05	-.24	-.37	-.23	-.06
7 Social support superiors		-.53	-.23	-.48	-.13	-.11	.31		.41	.06	.22	-.18	-.04	.02	-.06	.02	.05	-.01	-.01	-.12	-.01	-.25	-.08	-.19	-.37	-.19	-.12
8 Social support colleagues		-.45	-.17	-.43	-.12	-.08	.31	.51		.04	.18	-.14	-.02	.03	-.07	.01	.07	-.02	-.04	-.07	-.04	-.25	-.16	-.22	-.33	-.23	-.05
9 Work variety		-.14	.19	-.14	-.15	-.04	.16	.16	.16		.48	.30	-.06	-.03	.15	.05	-.05	-.03	.05	.23	-.09	.08	-.02	-.08	-.05	-.17	-.11
10 Possibilities for learning		-.27	.08	-.32	-.17	.01	.22	.35	.32	.43		.37	.03	.07	.07	-.01	-.11	-.08	.07	.34	-.07	.05	-.05	-.07	-.10	-.12	-.09
11 Taking work home		.09	.42	.01	-.11	.08	-.13	-.02	-.06	.28	.37		.03	.02	.20	-.01	-.19	-.08	.12	.47	-.04	.39	.02	.23	.34	.11	.02
12 Age youngest child		-.06	-.17	-.01	.06	-.02	.05	.02	.01	-.14	-.01	-.14		-.01	-.21	-.90	-.20	-.07	-.07	.34	.08	.02	-.32	-.03	.06	.06	-.04
13 Life event in private domain		.06	.03	.02	.02	.02	-.10	.00	-.04	-.01	.03	.04	-.04		.08	.04	-.12	.13	.07	.05	.02	.10	.18	.16	.06	.12	.16
14 (Need for) domestic help		.04	.20	.01	-.07	-.01	-.01	-.04	.06	.15	.11	.27	-.16	.01		.22	.09	.07	.15	.06	.09	.23	.10	.16	.14	.12	.11
15 (Need for) childcare		.03	.17	-.01	-.08	.03	-.02	-.02	.00	.17	.06	.18	.85	.05	.22		.14	.08	.08	-.30	-.07	.00	.32	.06	-.03	-.05	.08
16 Support from children		.02	.10	-.12	.02	-.02	.13	.03	.06	.14	.01	.08	-.15	-.02	.05	.18		.03	-.01	-.22	.05	-.10	-.01	-.13	-.10	-.09	-.16
17 Family care		.04	.04	-.01	.02	.07	-.01	-.02	-.04	.03	-.02	.05	-.03	.02	.03	.04	.07		-.04	-.07	.06	.06	.13	.12	.07	.16	.09
18 Burden of commuting		-.05	.04	.02	.05	-.04	-.02	.03	-.03	.09	.06	.11	-.05	.01	.03	.07	-.05	-.02		.02	.02	.17	.06	.13	.14	.08	.08
19 Hours worked weekly		.11	.34	-.03	-.04	.04	-.14	-.02	-.01	.28	.33	.52	-.04	.02	.20	.03	.14	-.05	-.03		-.09	.32	-.11	.05	.20	.04	-.04
20 Presence chronic disease		.10	.00	.04	.12	-.03	-.05	-.15	-.13	-.03	-.12	-.02	.05	.12	.05	-.03	.10	.08	.04	-.06		.09	.03	.19	.08	.28	.18
21 W→FI		.38	.53	.23	.19	.13	-.42	-.23	-.24	.09	-.02	.36	-.11	.15	.14	.11	.02	.02	.14	.34	.05		.32	.50	.61	.42	.17
22 F→WI		.21	.14	.18	.10	-.01	-.15	-.13	-.13	-.02	-.16	-.01	-.20	.12	.02	.17	.00	.05	.12	-.03	.00	.35		.23	.18	.16	.17
23 Fatigue		.33	.27	.25	.18	.14	-.32	-.28	-.26	-.11	-.21	.12	-.02	.14	.04	.03	-.01	.01	.08	.00	.15	.44	.17		.62	.64	.28
24 Emotional exhaustion		.44	.45	.31	.19	.17	-.39	-.39	-.33	-.11	-.21	.17	-.04	.13	.05	.01	-.03	.03	.05	.06	.12	.56	.21	.70		.52	.24
25 Perceived health complaints		.36	.29	.23	.27	.15	-.28	-.33	-.29	-.12	-.19	.14	.03	.12	.04	-.04	.06	.03	.07	.01	.24	.42	.12	.68	.65		.32
26 Sick leave		.11	.03	.06	.06	.12	-.04	-.15	-.11	-.07	-.12	.12	-.05	.11	.01	.05	.01	.03	.02	-.11	.18	.11	.08	.25	.23	.25	



### Model Evaluation

Table 4 summarizes the goodness-of-fit indices of the four models. Model A was the model in which none of the disturbances were allowed to covary. The large  $\chi^2$  revealed poor fit. In model B, the covariances between the disturbances of the health-related characteristics were set free, which improved the fit, but a highly significant  $\chi^2$  was still found. Next, in model C, the disturbances between W→FI and F→WI were allowed to covary. This model had a satisfactory fit; but there were a lot of non-significant parameters in both sexes. Therefore, the model was made more parsimonious. In our final model, a parameter between two variables was significant for in least one of the two sexes. Examination of the modification indices revealed that freeing of any of the remaining parameters would not substantially improve the fit of the model. The goodness-of-fit indices NFI, NNFI, CFI and GFI in both sexes were all well above the 0.90 cut-off points typically used to indicate satisfactory fit between model and data (Kline 1998). RMSEA and SRMR were quite small, which also indicated satisfactory fit.

**Table 4** Fit indices of the four structural equation models.

	Overall						
	$\chi^2$	df	p	RMSEA	NFI	NNFI	CFI
Model A: disturbances did not covary	357.1	12	<.001	.178	.99	.40	.99
Model B: covariance between disturbances health-related characteristics	165.1	6	<.001	.171	.99	.22	.99
Model C: covariances between disturbances W→FI and F→WI	7.0	4	.137	.029	1.00	.98	1.00
Final model	144.6	136	.292	.008	.99	1.00	1.00

	Men				Women			
	$\chi^2$	RMR	SRMR	GFI	$\chi^2$	RMR	SRMR	GFI
Model A: disturbances did not covary	113.6	.007	.009	.99	143.4	.007	.014	.98
Model B: covariance between disturbances health-related characteristics	7.6	.014	.010	.99	86.6	.018	.013	.99
Model C: covariances between disturbances W→FI and F→WI	1.4	.001	.002	1.00	5.6	.002	.003	1.00
Final model (parameters presented in Table 5 and 6)	68.5	.025	.011	1.00	78.0	.051	.013	.99

Explanations of abbreviations:

RMSEA: Root Mean Square Error of Approximation (cut-off point for satisfactory fit: <.08).

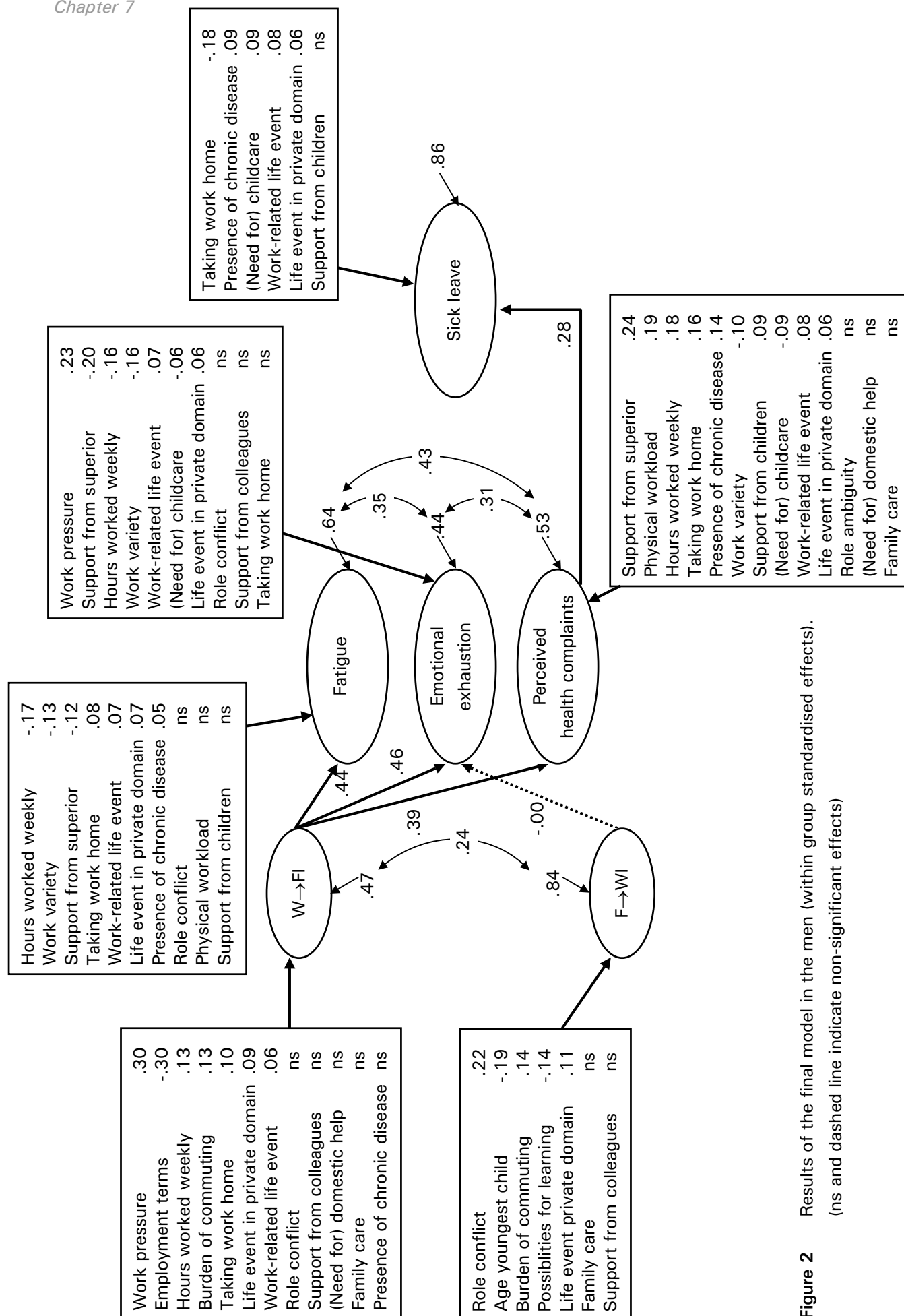
NFI: Normed Fit Index (cut-off point for satisfactory fit: >.90).

CFI: Comparative Fit Index (cut-off point for satisfactory fit: >.90).

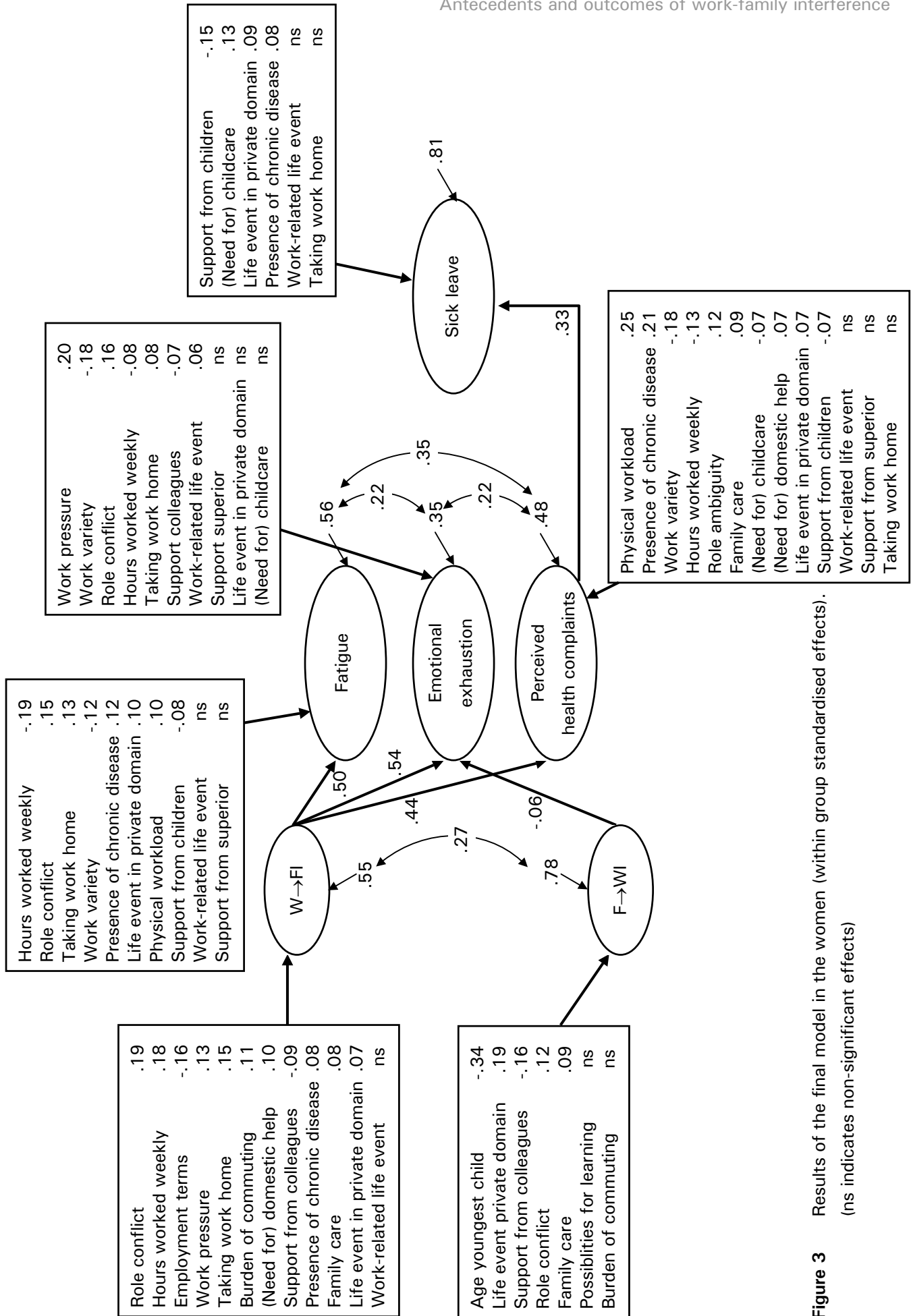
RMR: Root Mean Squared Residual (the smaller the RMR, the better the fit).

SRMR: Standardised Root Mean Squared Residual (cut-off point for satisfactory fit: <.10).

GFI: Goodness of Fit Index (cut-off point for satisfactory fit: >.90).



**Figure 2** Results of the final model in the men (within group standardised effects). (ns and dashed line indicate non-significant effects)



**Figure 3** Results of the final model in the women (within group standardised effects).  
(ns indicates non-significant effects)

### **Antecedents of work-family interference**

Parameter estimates of the final model are presented in Figure 2 and Figure 3 for the men and women, respectively. Higher work pressure, less satisfaction with employment terms, more burden of commuting and more often taking work home led to more  $W \rightarrow FI$  in both the men and women. In both sexes, a life event in private domain contributed slightly to the explanation of  $W \rightarrow FI$ . However, the associations found for work pressure and employment terms were significantly stronger in the men than in the women. Moreover, in the men,  $W \rightarrow FI$  was caused by an experienced work-related life event. In the women, more role conflict led to more  $W \rightarrow FI$ . In addition, (need for) domestic help, less support from colleagues and providing family care were weakly associated with more  $W \rightarrow FI$ . The set of antecedents explained 53% and 45% of the variance in  $W \rightarrow FI$  in the men and women, respectively.

Results regarding  $F \rightarrow WI$  showed that a younger age of the youngest child, more role conflict and a life event in private domain led to more  $F \rightarrow WI$  in both sexes, but the association between the age of the youngest child and  $F \rightarrow WI$  was significantly stronger in the women than in the men. In the men, additional antecedents were found: more burden of commuting induced more  $F \rightarrow WI$ ; more possibilities for learning led to less  $F \rightarrow WI$ . In the women, less social support from colleagues and providing family care induced more  $F \rightarrow WI$ . The proportion of explained variance in  $F \rightarrow WI$  was slightly higher in the women than in the men (22% vs. 16%).

### **Outcomes of work-family interference**

$W \rightarrow FI$  played a major role in the explanation of the three health-related characteristics in the men and women. Although not statistically significant, the associations between  $W \rightarrow FI$  and health-related characteristics were slightly higher in the women.  $F \rightarrow WI$  was only negatively associated with emotional exhaustion in the women, but the relationship was weak.

In addition to  $W \rightarrow FI$ , work- and family-related characteristics contributed to the explanation of fatigue, emotional exhaustion and perceived health complaints. Direct and indirect effects could be distinguished. These are presented in Table 5 and Table 6, for the men and women, respectively. The direct effects are identical to the results presented in Figure 2 (men) and Figure 3 (women). Indirect effects indicate associations of work- and family-related characteristics via  $W \rightarrow FI$  or  $F \rightarrow WI$  (although in this study, indirect effects only occurred through  $W \rightarrow FI$ ). Total effects were obtained by adding the direct and indirect effects. Owing to our particular interest in the explanation of sick leave, we describe the direct effects as well as the total effects of this dependent variable. For fatigue, emotional exhaustion and perceived health complaints we describe the total effects only.

**Table 5** Direct, indirect and total effects in the final structural equation model in the men (within group standardised effects,  $n = 975$ ).

Antecedent	W→FI		F→WI		Fatigue			Emotional exhaustion			Perceived health complaints			Sick leave		
	direct		direct		direct	indirect <sup>+</sup>	total	direct	indirect <sup>+</sup>	total	direct	indirect <sup>+</sup>	total	direct	indirect <sup>+</sup>	total
Role conflict	.10		.22 <sup>c</sup>		.05	.04	.09	.03	.04	.08	-	.04	.04	-	.01	.01
Work pressure	.30 <sup>c</sup>		-		-	.14 <sup>c</sup>	.14 <sup>c</sup>	.23 <sup>c</sup>	.14 <sup>c</sup>	.37 <sup>c</sup>	-	.12 <sup>c</sup>	.12 <sup>c</sup>	-	.03 <sup>c</sup>	.03 <sup>c</sup>
Role ambiguity	-		-		-	-	-	-	-	-	-.02	-	-.02	-	-.01	-.01
Physical workload	-		-		.06	-	.06	-	-	-	.19 <sup>c</sup>	-	.19 <sup>c</sup>	-	.05 <sup>c</sup>	.05 <sup>c</sup>
Work-related life event	.06 <sup>b</sup>		-		.07 <sup>a</sup>	.03 <sup>a</sup>	.09 <sup>b</sup>	.07 <sup>b</sup>	.03 <sup>a</sup>	.10 <sup>c</sup>	.08 <sup>b</sup>	.02 <sup>a</sup>	.11 <sup>c</sup>	.08 <sup>b</sup>	.03 <sup>b</sup>	.11 <sup>c</sup>
Employment terms	-.30 <sup>c</sup>		-		-	-.13 <sup>c</sup>	-.13 <sup>c</sup>	-	-.14 <sup>c</sup>	-.14 <sup>c</sup>	-	-.12 <sup>c</sup>	-.12 <sup>c</sup>	-	-.03 <sup>c</sup>	-.03 <sup>c</sup>
Social support superiors	-		-		-.12 <sup>b</sup>	-	-.12 <sup>b</sup>	-.20 <sup>c</sup>	-	-.20 <sup>c</sup>	-.24 <sup>c</sup>	-	-.24 <sup>c</sup>	-	-.07 <sup>c</sup>	-.07 <sup>c</sup>
Social support colleagues	-.01		.03		-	-.01	-.01	-.02	-.01	-.02	-	-.01	-.01	-	-.00	-.00
Work variety	-		-		-.13 <sup>b</sup>	-	-.13 <sup>b</sup>	-.16 <sup>c</sup>	-	-.16 <sup>c</sup>	-.10 <sup>b</sup>	-	-.10 <sup>a</sup>	-	-.03 <sup>a</sup>	-.03 <sup>a</sup>
Possibilities for learning	-		-.14 <sup>c</sup>		-	-	-	-	.00	.00	-	-	-	-	-	-
Taking work home	.10 <sup>b</sup>		-		.08 <sup>a</sup>	.04 <sup>b</sup>	.13 <sup>c</sup>	.04	.05 <sup>b</sup>	.08 <sup>a</sup>	.16 <sup>c</sup>	.04 <sup>b</sup>	.20 <sup>c</sup>	-.18 <sup>c</sup>	.06 <sup>c</sup>	-.13 <sup>c</sup>
Age youngest child	-		-.19 <sup>c</sup>		-	-	-	-	.00	.00	-	-	-	-	-	-
Life event in private domain	.09 <sup>c</sup>		.11 <sup>c</sup>		.07 <sup>a</sup>	.04 <sup>b</sup>	.11 <sup>c</sup>	.06 <sup>a</sup>	.04 <sup>b</sup>	.10 <sup>c</sup>	.06 <sup>a</sup>	.04 <sup>b</sup>	.10 <sup>b</sup>	.06 <sup>a</sup>	.03 <sup>b</sup>	.09 <sup>b</sup>
(Need for) domestic help	.02		-		-	.01	.01	-	.01	.01	.02	.01	.03	-	.01	.01
(Need for) childcare	-		-		-	-	-	-.06 <sup>a</sup>	-	-.06 <sup>a</sup>	-.09 <sup>c</sup>	-	-.09 <sup>c</sup>	.09 <sup>b</sup>	-.03 <sup>b</sup>	.07 <sup>a</sup>
Support from children	-		-		.02	-	.02	-	-	-	.09 <sup>b</sup>	-	.09 <sup>b</sup>	-.02	.03 <sup>b</sup>	.01
Family care	-.01		.04		-	-.00	-.00	-	-.00	-.00	-.01	-.00	-.01	-	-.00	-.00
Burden of commuting	.13 <sup>c</sup>		.14 <sup>c</sup>		-	.06 <sup>c</sup>	.06 <sup>c</sup>	-	.06 <sup>c</sup>	.06 <sup>c</sup>	-	.05 <sup>c</sup>	.05 <sup>c</sup>	-	.01 <sup>c</sup>	.01 <sup>c</sup>
Hours worked weekly	.13 <sup>c</sup>		-		-.17 <sup>c</sup>	.06 <sup>c</sup>	-.11 <sup>b</sup>	-.16 <sup>c</sup>	.06 <sup>c</sup>	-.10 <sup>b</sup>	-.18 <sup>c</sup>	.05 <sup>c</sup>	-.13 <sup>c</sup>	-	-.04 <sup>c</sup>	-.04 <sup>b</sup>
Presence of chronic disease	.03		-		.05 <sup>a</sup>	.02	.07 <sup>a</sup>	-	.02	.02	.14 <sup>c</sup>	.01	.15 <sup>c</sup>	.09 <sup>b</sup>	.04 <sup>c</sup>	.14 <sup>c</sup>
W→FI					.44 <sup>c</sup>	-	.44 <sup>c</sup>	.46 <sup>c</sup>	-	.46 <sup>c</sup>	.39 <sup>c</sup>	-	.39 <sup>c</sup>	-	.11 <sup>c</sup>	.11 <sup>c</sup>
F→WI					-	-	-	.00	-	.00	-	-	-	-	-	-
Fatigue					-	-	-	-	-	-	-	-	-	-	-	-
Emotional exhaustion					-	-	-	-	-	-	-	-	-	-	-	-
Perceived health complaints					-	-	-	-	-	-	-	-	-	-.28 <sup>c</sup>	-	-.28 <sup>c</sup>
Explained variance	.53		.16			.27	.46					.40			.09	

<sup>+</sup>: Indirect effect through W→FI/F→WI; #: Indirect effect through W→FI/F→WI and Perceived health complaints.

<sup>a</sup>:  $p \leq .05$ ; <sup>b</sup>:  $p \leq .01$ ; <sup>c</sup>:  $p \leq .001$ .

-: Data are not applicable.

**Table 6** Direct, indirect and total effects in the final structural equation model in the women (within group standardised effects,  $n = 862$ ).

Antecedent	W→FI		F→WI		Fatigue		Emotional exhaustion		Perceived health complaints		Sick leave	
	direct	total	direct	total	direct	indirect <sup>+</sup>	total	indirect <sup>+</sup>	direct	total	direct	indirect <sup>+</sup>
Role conflict	.19 <sup>c</sup>	.12 <sup>b</sup>	.15 <sup>b</sup>	.25 <sup>c</sup>	.16 <sup>b</sup>	.10 <sup>b</sup>	.25 <sup>c</sup>	.09 <sup>c</sup>	-	.09 <sup>c</sup>	-	.03 <sup>b</sup>
Work pressure	.13 <sup>a*</sup>	-	-	.06 <sup>b</sup>	.20 <sup>c</sup>	.07 <sup>b</sup>	.27 <sup>c</sup>	.06 <sup>b</sup>	-	.06 <sup>b</sup>	-	.02 <sup>b</sup>
Role ambiguity	-	-	-	-	-	-	-	.12 <sup>b*</sup>	-	.12 <sup>b</sup>	-	.04 <sup>b</sup>
Physical workload	-	-	.10 <sup>b</sup>	.10 <sup>a</sup>	-	-	-	.25 <sup>c</sup>	-	.25 <sup>c</sup>	-	.08 <sup>c</sup>
Work-related life event	.02	-	.02	.03	.06 <sup>a</sup>	.01	.07 <sup>a</sup>	.01	.06	.07	.04	.02
Employment terms	-.16 <sup>b*</sup>	-	-	-.08 <sup>c</sup>	-	-.09 <sup>c</sup>	-.09 <sup>c</sup>	-.07 <sup>c</sup>	-	-.07 <sup>c</sup>	-	-.02 <sup>b</sup>
Social support superiors	-	-	.05 <sup>*</sup>	.05	-.05	-	-.05	.01 <sup>*</sup>	-	.01	-	.00
Social support colleagues	-.09 <sup>a</sup>	-.16 <sup>c*</sup>	-	-.05	-.07 <sup>a</sup>	-.04	-.11 <sup>a</sup>	-.04	-	-.04	-	-.01
Work variety	-	-	-.12 <sup>b</sup>	-.12 <sup>a</sup>	-.18 <sup>c</sup>	-	-.18 <sup>c</sup>	-.18 <sup>c</sup>	-	-.18 <sup>c</sup>	-	-.06 <sup>b</sup>
Possibilities for learning	-	.01 <sup>*</sup>	-	-	-	-.00	-.00	-	-	-	-	-
Taking work home	.15 <sup>c</sup>	-	.13 <sup>c</sup>	.21 <sup>c</sup>	.08 <sup>a</sup>	.08 <sup>c</sup>	.16 <sup>c</sup>	.06 <sup>c</sup>	.04	.11 <sup>b</sup>	-.06 <sup>*</sup>	.04 <sup>b</sup>
Age youngest child	-	-.34 <sup>c*</sup>	-	-	-	.02 <sup>a</sup>	.02 <sup>a</sup>	-	-	-	-	-
Life event in private domain	.07 <sup>a</sup>	.19 <sup>c</sup>	.10 <sup>c</sup>	.14 <sup>c</sup>	.02	.02	.04	.03 <sup>a</sup>	.07 <sup>a</sup>	.10 <sup>b</sup>	.09 <sup>b</sup>	.03 <sup>b</sup>
(Need for) domestic help	.10 <sup>c</sup>	-	-	.05 <sup>c</sup>	-	.06 <sup>c</sup>	.06 <sup>c</sup>	.05 <sup>c</sup>	.07 <sup>a</sup>	.12 <sup>c</sup>	-	.04 <sup>c</sup>
(Need for) childcare	-	-	-	-	-.05	-	-.05	-	-.07 <sup>a</sup>	-.07 <sup>a</sup>	.12 <sup>c</sup>	-.03 <sup>b</sup>
Support from children	-	-	-.08 <sup>b*</sup>	-.08 <sup>c</sup>	-	-	-	-	-.07 <sup>a*</sup>	-.07 <sup>a</sup>	-.15 <sup>c*</sup>	-.02 <sup>b</sup>
Family care	.08 <sup>a</sup>	.09 <sup>a</sup>	-	.04 <sup>b</sup>	-	.04 <sup>b</sup>	.04 <sup>b</sup>	.03 <sup>b</sup>	.09 <sup>b*</sup>	.12 <sup>c</sup>	-	.04 <sup>c</sup>
Burden of commuting	.11 <sup>c</sup>	.02 <sup>*</sup>	-	.06 <sup>c</sup>	-	.06 <sup>c</sup>	.06 <sup>c</sup>	.05 <sup>b</sup>	-	.05 <sup>b</sup>	-	.02 <sup>b</sup>
Hours worked weekly	.18 <sup>c</sup>	-	-.19 <sup>c</sup>	-.10 <sup>b</sup>	-.08 <sup>b</sup>	.09 <sup>c</sup>	.01	.08 <sup>c</sup>	-.13 <sup>b</sup>	-.05	-	-.02
Presence of chronic disease	.08 <sup>b</sup>	-	.12 <sup>c</sup>	.16 <sup>c</sup>	-	.04 <sup>b</sup>	.04 <sup>b</sup>	.04 <sup>b</sup>	.21 <sup>c</sup>	.24 <sup>c</sup>	.08 <sup>a</sup>	.08 <sup>c</sup>
W→FI			.50 <sup>c</sup>	.50 <sup>c</sup>	.54 <sup>c</sup>	-	.54 <sup>c</sup>	-	.44 <sup>c</sup>	.44 <sup>c</sup>	-	.15 <sup>c</sup>
F→WI			-	-	-.06 <sup>a</sup>	-	-.06 <sup>b</sup>	-	-	-	-	-
Fatigue			-	-	-	-	-	-	-	-	-	-
Emotional exhaustion			-	-	-	-	-	-	-	-	-	-
Perceived health complaints			-	-	-	-	-	-	-	-	-	-
Explained variance	.45	.22		.30		.51		.42			.33 <sup>c</sup>	.12

<sup>+</sup>: Indirect effect through W→FI/F→WI; <sup>#</sup>: Indirect effect through W→FI/F→WI and Perceived health complaints.

<sup>a</sup>:  $p \leq .05$ ; <sup>b</sup>:  $p \leq .01$ ; <sup>c</sup>:  $p \leq .001$ .

-: Data are not applicable; \*: Significant differences between the men and women ( $p \leq .05$ ).

*Fatigue*

The total effects showed that fatigue was explained by more W→FI, higher work pressure, less satisfaction with employment terms, less work variety, more often taking work home, a life event in private domain and more burden of commuting in the men (Table 5) and the women (Table 6). However, the effects of work pressure and employment terms were stronger in the men than in the women. In the men, less social support from superiors and a work-related life event also contributed to fatigue. Results in the women showed that more role conflict, higher physical workload, less support from children, (need for) domestic help and providing family care were also associated with more fatigue. The proportions of explained variance in fatigue were 27% and 30%, in the men and the women, respectively.

*Emotional exhaustion*

The results of the total effects showed that in both sexes, more W→FI, higher work pressure, less work variety, less satisfaction with employment terms, a work-related life event, more burden of commuting and more often taking work home caused more emotional exhaustion. In the men, less social support from superiors, a life event in private domain and (need for) childcare were associated with more emotional exhaustion (Table 5). In the women, more role conflict, less social support from colleagues, (need for) domestic help, providing family care and a younger age of the youngest child were associated with more emotional exhaustion (Table 6). However, the latter three effects were only weak. In the women, the proportion of explained variance in emotional exhaustion was slightly higher than in the men (51% vs. 46%).

*Perceived health complaints*

In both the men and women, the total effects showed that perceived health complaints were caused by more W→FI, taking work home more often, higher physical workload, higher work pressure, less satisfaction with employment terms, less work variety and a life event in private domain. Less (need for) childcare and more burden of commuting explained perceived health complaints in both sexes, but these relationships were weaker. In the men, the total effects of taking work home more often and higher work pressure were somewhat stronger than in the women. Conversely, higher physical workload and less work variety were more strongly associated with perceived health complaints in the women. Some group-specific relationships were also found. In men, less social support from superiors and a work-related life event contributed to more perceived health complaints (Table 5), whereas in the women, perceived health complaints were associated with more role ambiguity, providing family care, (need for) domestic help and more role conflict (Table 6). In the

men, more support from the children was associated with more perceived health complaints, whereas less support from the children was associated with more perceived health complaints in the women. The proportions of explained variance were 40% and 42% in the men and women, respectively.

### *Sick leave*

In the men and women,  $W \rightarrow FI$  and  $F \rightarrow WI$  did not directly cause sick leave. Among the health-related characteristics, only perceived health complaints contributed to the explanation of sick leave. This was found in both the men and women. In both sexes, (need for) childcare and a life event in private domain were also directly associated with sick leave. In the men, taking work home more often was associated with less sick leave, and a work-related life event was associated with more sick leave. In the women, more support from the children contributed to less sick leave.

Pertaining to the total effects, more sick leave was caused by perceived health complaints and  $W \rightarrow FI$  in the men and women. Several study variables contributed to the explanation of sick leave in both sexes, but the associations were weaker: a life event in private domain, more (need for) childcare, higher physical workload, higher work pressure, more satisfaction with employment terms, more work variety and more burden of commuting contributed to the explanation of more sick leave. Moreover, in the men, more sick leave was associated with taking work home less often, a work-related life event and less support from superiors. In the women, more sick leave was explained by less support from the children and there were weak associations with role ambiguity, providing family care, (need for) domestic help and role conflict. The proportions of explained variance in sick leave were 9% and 12% in the men and women, respectively.

### *Potential confounders*

In the men and women, more hours worked weekly led to more  $W \rightarrow FI$ , but there were no effects on  $F \rightarrow WI$  (Figures 2 and 3 for the men and women, respectively). A negative, direct association was found with the health-related characteristics, which implies that working more hours is associated with less fatigue, less emotional exhaustion and fewer perceived health complaints. The association with emotional exhaustion was stronger in the men (-0.16 vs. -0.08 in the women), but the difference was not statistically significant. The total effects showed that more hours worked weekly were associated with less fatigue, emotional exhaustion and perceived health complaints in the men, whereas in the women more hours worked weekly were only associated with less fatigue (Tables 5 and 6 for the men and women,



respectively). In the men, a weak association with sick leave was found: more hours worked weekly are related to less sick leave.

The presence of chronic disease contributed to the explanation of more W→FI in the women, but not in the men. In both sexes, there were no effects on F→WI. The direct effect of the presence of chronic disease on fatigue was stronger in the women than in the men (although not statistically significant). The same applied to the total effect on fatigue. An indirect effect on emotional exhaustion was found in the women: the presence of chronic disease contributed to more emotional exhaustion via W→FI. In both the men and women, direct as well as total effects showed that the presence of chronic disease played a role in the explanation of perceived health complaints, with stronger (but not statistically significantly different) effects in the women than in the men. The presence of chronic disease led to more sick leave both directly and indirectly via W→FI. The effects were equally strong in the men and women. Compared to the other significant associations, the results showed that the presence of chronic disease was one of the stronger antecedents of sick leave.

## DISCUSSION

In the present study, we investigated antecedents and outcomes of work-family interference in a heterogeneous population of Dutch university employees. The aim was to test a comprehensive model to determine the antecedents of W→FI and F→WI as well as the associations with fatigue, emotional exhaustion, perceived health complaints and sick leave. In addition, in view of sex differences in work-related characteristics, family-related characteristics and health and the mixed results pertaining to sex differences in WFI described in the literature, we focused on differences in associations between men and women. Results showed that we were able to obtain a satisfactory fit using structural equation modelling (Table 4). In this section we discuss our findings. First, we summarize the main results on the associations between WFI and the health-related characteristics. Owing to our interest in the antecedents of sick leave, we put more emphasis on these results than on the other health-related characteristics. Second, attention is paid to the antecedents of WFI. The third point of discussion is the differences in the study variables between the men and women. Finally, some methodological considerations are discussed and recommendations for further research are given.

### **WFI and health-related characteristics**

Our results showed that in both the men and women,  $W \rightarrow FI$  had a strong effect on fatigue, emotional exhaustion and perceived health complaints. Although  $W \rightarrow FI$  was strongly associated with sick leave, no direct associations were found, but the effects ran through perceived health complaints. The strengths of the associations between  $W \rightarrow FI$  and the health-related characteristics were comparable with the results of other studies (Burke 1988; Geurts et al. 1999; Allen et al. 2000). It was hypothesized that  $F \rightarrow WI$  would be positively associated with higher scores on the health-related characteristics and sick leave (Frone et al. 1992). Other studies found evidence of these relationships (Gignac et al. 1996; Jansen 2003). However, our results showed a negative, but very weak, association between  $F \rightarrow WI$  and emotional exhaustion in the women. Apparently, in our population,  $F \rightarrow WI$  was not associated with the health-related characteristics. One explanation may be that high autonomy in university employees makes it easier to resolve family-related difficulties and consequently,  $F \rightarrow WI$  was lower than in other populations. We found somewhat lower levels of  $F \rightarrow WI$  in women than those reported by Carlson et al. (2000). This comparison probably supports our explanation.

### **Antecedents of sick leave**

As mentioned above,  $W \rightarrow FI$  contributed indirectly to the explanation of sick leave in the men and women. Besides  $W \rightarrow FI$ , other study variables had significant (direct or indirect) effects on sick leave. In descending order, more sick leave in the men was mostly explained by more perceived health complaints, presence of chronic disease, taking work home less often, a work-related life event and more  $W \rightarrow FI$ . In the women, more perceived health complaints, less support from the children, the presence of chronic disease, more  $W \rightarrow FI$  and a life event in private domain contributed to more sick leave. In both sexes, more (need for) childcare, higher physical workload, higher work pressure, less satisfaction with employment terms, less work variety and more burden of commuting were also associated with more sick leave, but the associations were weaker and not all the associations were equally strong in the men and women. Furthermore, in the men, more social support from superiors led to less sick leave. In the women, role ambiguity, family care, (need for) domestic help and role conflict were (weakly) associated with more sick leave.

These results demonstrated that in both sexes,  $W \rightarrow FI$  was an important antecedent of sick leave, in contrast with  $F \rightarrow WI$ . Our study also showed that other antecedents were associated with sick leave and that there were considerable differences between the men and women. In the women, family-related characteristics (e.g. support from the children, a life event in private domain, family care) were more important for the

explanation of sick leave than in the men, whereas work-related characteristics (e.g. a work-related life event, social support from superiors, work pressure) played a larger role in the male respondents.

In both the men and women, only the health-related characteristic perceived health complaints was associated with sick leave. No relationships were found between fatigue or emotional exhaustion and sick leave. In a previous study based on the same data set (Roskes et al. 2005), fatigue and emotional exhaustion were found to be associated with sick leave measures in employees with and without chronic diseases. Sick leave variables used by Roskes et al. (2005) were different from the one used in this study, whereas family-related characteristics and WFI were not included, which may partially explain the different study results.

In general, the presence of chronic disease has not been taken into consideration in studies on relationships between WFI and health-related outcomes. However, our results showed that the presence of chronic disease was rather strongly associated with sick leave, in the men and women. Hours worked weekly were not related to sick leave in the women, but a negative association was found in the men. Being on sick leave is associated with ill health (e.g. perceived health complaints), and in general, persons with ill health are less inclined to put in long working hours.

The study variables explained 9% and 12% of the variance in sick leave in the men and women, respectively. Although these percentages were not very high, the results were comparable with another Dutch study on determinants of sick leave (Van Deursen et al. 1999). Variance in sick leave might have been constrained by the nature of the occupations of the study sample (Thomas and Ganster 1995). Owing to high autonomy (Donders et al. 2003a) and informal arrangements with superiors, university employees are often able to take some time off and this probably prevents sick leave. Compared to the Dutch sick leave figure of 5.4%, the 4.6% in our university personnel was fairly low.

### **Antecedents of WFI**

Frone et al. (1992) stated that associations between antecedents of WFI might be domain-specific. This means that antecedents of  $W \rightarrow FI$  would be work-related, whereas antecedents of  $F \rightarrow WI$  would be family-related. In addition, Kinnunen and Mauno (1998) proposed that work-related characteristics could also be associated with  $F \rightarrow WI$ , but to a lesser extent. The same applied to family-related characteristics and  $W \rightarrow FI$ .

Our results showed that in the men, the antecedents most strongly associated with higher levels of  $W \rightarrow FI$  were (in descending order) higher work pressure, less satisfaction with employment terms, more hours worked weekly, more burden of

commuting and taking work home more often. In the women, the strongest antecedents were more role conflict, more hours worked weekly, less satisfaction with employment terms, higher work pressure, taking work home more often, more burden of commuting and (need for) domestic help. Compared to the women, the men showed significantly stronger associations with work pressure and satisfaction with employment terms.

In the men, more F→WI was associated with (in descending order) more role conflict, younger age of the youngest child, more burden of commuting, more possibilities for learning and a life event in private domain in the past 12 months. In the women, results showed that younger age of the youngest child, a life event in private domain in the past 12 months, less support from colleagues and more role conflict contributed to the explanation of F→WI. The association with the age of the youngest child was significantly stronger in the women than in the men.

Hours worked weekly were strongly related to W→FI, but not to F→WI. This has also been reported elsewhere (Gutek et al. 1991; Netemeyer et al. 1996). The presence of chronic disease was weakly associated with W→FI in the women. Apparently, the women with a chronic disease were experiencing more difficulties in their working roles, which intruded into their private lives.

The set of antecedents explained a high proportion of variance in W→FI in both the men and the women (53% and 45%, respectively), whereas in F→WI this was somewhat lower (16% and 22% in the men and women, respectively). An explanation may partly be found in the way the antecedents were assessed: the work-related characteristics were assessed more subjectively, while the family-related characteristics were assessed somewhat more objectively. Groenendijk (1998) reported that the appraisal of combining paid work with family responsibilities was an important factor in the whole set of factors related to well-being. Therefore, attention should be paid to assessing the family-related characteristics more subjectively. For example, we assessed the division of household tasks and care for children by asking who was doing the most, but we did not ask whether the respondents were content with the task division between the partners. It is possible that placing more emphasis on the quality of family life may increase the proportions of explained variance in F→WI and also in the health-related characteristics and sick leave.

The sex differences regarding the proportions of explained variance in W→FI and F→WI, and the associations between work- or family-related characteristics and W→FI or F→WI reflected the 'traditional' inequities in the distribution of paid work and care tasks: men work longer hours outside the home, while women spend more time taking care of the children and the household. We found that some work-related characteristics were more important in the explanation of sick leave in the men,

whereas some family-related characteristics were more important in the women. Moreover, the proportion of explained variance in  $W \rightarrow FI$  was higher in the men than in the women, while it was vice versa in  $F \rightarrow WI$ .

### **Domain-specific relationships**

As our research model was more comprehensive than other models in this research field, it was difficult to compare our findings to the results from other studies. In general, the associations were in accordance with our hypotheses. Our results supported the additional relationships proposed by Kinnunen and Mauno (1998). We found an association between a life event in private domain and  $W \rightarrow FI$  in the men and the women. It is possible that owing to the life event in private domain, the employees in question were not their usual selves and their working roles may (temporarily) not have had the highest priority. Therefore, work interfered with their private lives. A similar explanation may apply to the association between family care and  $W \rightarrow FI$  in the women. Burden of commuting was associated with  $W \rightarrow FI$  (in the men and women) and with  $F \rightarrow WI$  (in the men only). We classified this as a family-related characteristic, but this antecedent could also have been classified as a work-related characteristic. Travelling back and forth is a transition between work and family life and may therefore affect both domains.  $W \rightarrow FI$  was related to (need for) domestic help in the women. In this case,  $W \rightarrow FI$  probably led to the (need for) domestic help instead of the other way around. Support from colleagues resulted in less  $F \rightarrow WI$  in the women. It is possible that because of the demands in the family role (e.g. taking the children to school) family life interfered with work, but colleagues (temporarily) took over some of the work.

In addition to the domain-specific relationships between antecedents and WFI, Frone et al. (1992) proposed that the relationships between WFI and outcomes might also be domain-specific. Thus,  $W \rightarrow FI$  would influence family-related outcomes (e.g. family satisfaction) and  $F \rightarrow WI$  would influence work-related outcomes (e.g. job satisfaction, job performance). Both  $W \rightarrow FI$  and  $F \rightarrow WI$  would have general outcomes (e.g. perceived health complaints and depression). These hypotheses could not be confirmed in this study: fatigue and perceived health complaints could be considered as general outcomes (Geurts et al. 2003), whereas emotional exhaustion was more work-related. All three outcomes were strongly associated with  $W \rightarrow FI$  in the men and the women.  $F \rightarrow WI$  was associated with emotional exhaustion in the women, which was partially in concordance with the proposals made by Frone's et al. (1992). However, as mentioned before, we found a very weak and negative relationship instead of a positive relationship.

We found evidence of a mediating role of WFI (especially  $W \rightarrow FI$ ) in the relationships between work- or family-related characteristics and health-related characteristics and sick leave. More researchers showed that WFI plays a partly mediating role (Bacharach et al. 1991; Geurts et al. 1999). Geurts et al. (2003) proposed that  $W \rightarrow FI$  plays a fully mediating role in the relationships between workload and general outcome measures (i.e. fatigue and perceived health complaints) and a partially mediating role in the relationships between workload and work-related outcome measurements. Our results supported this: workload was only indirectly related with fatigue and perceived health complaints through  $W \rightarrow FI$ , but both indirectly and directly related to emotional exhaustion.

In addition to the domain-specific relationships, Frone et al. (1992) proposed reciprocal relationships between  $W \rightarrow FI$  and  $F \rightarrow WI$  as well as covariances between the disturbances of these two measures. Carlson and Kacmar (2000) made similar reports. However, we were unable to reproduce the reciprocal relationships with our model. We can only guess for an explanation. Frone et al. (1992) included four scales in their analyses: 'job stressors' and 'job involvement' versus 'family stressors' and 'family involvement', of which the items were based on the items of the work-related scales. The work- and family-related variables were therefore rather similar. Our sets of work- and family-related characteristics were more comprehensive and did not include the same type of antecedents. Thus, it is possible that the direct associations between work- and family-related characteristics may be substitutes for the reciprocal relationships between  $W \rightarrow FI$  and  $F \rightarrow WI$  reported in other studies.

### **Sex differences in study variables**

We already described differences between men and women in associations between study variables. In this section we will describe sex differences in the occurrence of antecedents, WFI and health-related characteristics and sick leave. On average, the male respondents were older and had a higher education level and higher employment function than the women (Table 1). Regarding the work-related characteristics, the men reported more role conflict and higher work pressure, they took work home more often and they worked more hours weekly, but they also reported more satisfaction with employment terms, more work variety and more possibilities for learning (Table 2). Regarding the family-related characteristics, results showed more of the women had faced a life event in private domain and the men had received more support from the children than women. As *Student's t*-tests were actually inappropriate for the categorical variables,  $\chi^2$ -tests were also conducted (data not shown;  $p < 0.001$ ). These analyses showed differences in the age of the youngest child, (need for) domestic help and (need for) childcare. More of the women were childless or had children of

< 4 years of age than the men. More of the men were classified into the category 'no children living at home'. These differences may partly be explained by age differences: the men were older than the women and consequently had older children. This may explain why the men perceived more support from the children. More of the women reported that they wanted domestic help, but did not have any. More of the men reported that they did not use childcare and did not need it. Regarding the health-related characteristics, the women reported more fatigue, more perceived health complaints and more sick leave than the men (Table 2). There were no differences in F→WI, but the men reported more W→FI than the women. This has also been found elsewhere (Eagle et al. 1998; Wagena and Geurts 2000). According to Eagle et al. (1998) these findings may suggest that changes in family role expectations are taking place. Men who are closely involved in their family responsibilities are more likely to be judged as less committed to the job by their superiors and colleagues. As a result of the expectations that organisations place on them, men may find it more difficult to combine work and family activities (Duxbury and Higgins 1991; Eagle et al. 1998).

Our results support the consistent findings that the W→FI scores were higher than the F→WI scores (Frone et al. 1992; Eagle et al. 1998; Carlson et al. 2000).

### **Methodological considerations**

One of the limitations of our study was its cross-sectional design. Therefore, we could not establish causality. For example, it may be reasonable to argue that the respondents who reported fatigue, emotional exhaustion or perceived health complaints, or the respondents who were on sick leave, were less able to manage the dual demands of work and family, or that the health condition of the respondents influenced the work- and family-related characteristics (Kelloway et al. 1999; Kinnunen et al. 2004). We found some indications of this. For example, in the women, there was a positive association between (need for) domestic help and W→FI. Presumably, W→FI was the cause of having and/or wanting domestic help instead of the reverse. Another example was the positive relationship between support from the children and perceived health complaints in the men: the men who had more health complaints probably received more support from their children. In the women, a negative association was found, which may imply that receiving support from the children protects against perceived health complaints. Some longitudinal studies showed that assumed outcomes could be precursors of WFI. For example, Kinnunen et al. (2004) reported that in men, a low level of satisfaction or well-being functioned as a precursor of W→FI. Kelloway et al. (1999) stated that stress was a

predictor of strain-based  $W \rightarrow FI$ . Therefore, more longitudinal research is necessary to unravel the exact relationships between antecedents, WFI and outcomes.

Our response rate of 49.1% was rather typical of that obtained in mail surveys (Sommer and Sommer 1997; Kelloway et al. 1999). In general, in an analytical study such as ours, variance is more important than a high response (Kristensen 1995). As a general rule, ten respondents are needed for every variable included in a structural equation model (Kline 1998). Thus, the number of respondents was sufficient to conduct our analyses. However, due to the anonymous design, it was not possible to perform in-depth non-response analyses. We found that somewhat more women returned the questionnaire than men and we have some anecdotal evidence that the women were more interested in this research topic. Nevertheless, the scores on the scales that assessed WFI were not at the end of the range, which suggested that the respondent group not only comprised persons with a great deal of WFI (Kelloway et al. 1999). On the other hand, employees with difficulties facing up to the demands of work and/or family, may have been less willing to find the time to fill in the questionnaire. Thus, the 'healthy survivor effect' may be also applicable. Our results showed a negative association between hours worked weekly and our health-related characteristics. An explanation for this is that the respondents with fairly good health, i.e. those with less fatigue, less emotional exhaustion and fewer perceived health complaints, were more capable of working longer hours.

In this study, the respondents were all employees at a university, which means that the majority of jobs were white-collar. The work-related characteristics may differ essentially from those in other segments of the labour force, e.g. machine-paced or dangerous work, manual material handling/higher physical workload, noise, dust and toxic compounds, et cetera. Compared to the Dutch sick leave figure of 5.4%, the 4.6% among our university personnel was fairly low. Therefore, our results may be difficult to generalise. However, in general, the patterns found in this study correspond with other Dutch research (Jettinghoff et al. 2004).

In our analyses using structural equation modelling, we made a selection, so not all the available variables were included. Two potential control variables, viz. employment function and age of the respondent, were omitted. Other research showed high correlations between the age of the respondent and the age of the youngest child (Kinnunen et al. 2004). This was also true in our study (data not shown). Including the age of the youngest child, therefore, controlled for the age of the respondent. Employment function was not taken into consideration either. Bültmann et al. (2001) reported that a person's occupation added relatively little explanatory information beyond perceived measures of the psychosocial work environment. Otten et al. (1998) stated that correction for employment function may imply overcorrection. However, employment function might express dimensions that



are important to health and sick leave, such as life-style factors and health care accessibility skills.

As with all our study variables, the assessment of sick leave was based on self-reported data. It has been stated that self-reported sick leave is lower than that registered by the company (Otten et al. 1998; Severens et al. 2000). Sick leave registers would be a reliable source of information to obtain the number of days of sick leave in study participants (Burdorf et al. 1996; Severens et al. 2000). However, due to our anonymous design, we were unable to link up with the sick leave register of the university. It is possible that the employees who were on long-term sick leave (e.g. because of problems at work or at home) did not return the questionnaire. Recall bias in the frequency or duration of sick leave may also have occurred. Ferrie et al. (2005) reported that more than two thirds of their respondents had a discrepancy of two days or less. Our measurement for sick leave was based on dichotomised information on the frequency and number of weeks of sick leave (Roskes et al. 2005). The cut-off points were rather high compared to the data reported by Ferrie et al. (2005). Therefore, we expect that the influence of misclassification regarding sick leave was rather limited.

### **Further research**

In this study, the outcome measures were health-related characteristics and sick leave. Other possible outcomes, such as job performance, intention to turnover and organizational commitment might be involved in future research, because of their additional potential interest to employers. Including this type of outcomes can be expected to emphasize the need to pay more attention to the difficulties of combining paid work and family issues. In addition, family-related outcomes, such as family satisfaction and marital satisfaction may help to increase the proportion of explained variance in sick leave.

The significance of the three different forms of WFI (viz. time-, strain- and behaviour-based WFI) needs to be further investigated. In a previous study, this multidimensional concept of WFI was used to investigate the relationships between work- and family-related characteristics and we found evidence of six distinct dimensions (Donders et al. *submitted*). It is possible that some of the WFI dimensions contribute more strongly to the explanation of health-related characteristics than others.

## CONCLUSIONS

We found strong evidence that WFI (especially W→FI) plays a mediating role in the relationships between work- or family-related characteristics and the outcomes health-related characteristics or sick leave. Employers as well as physicians (e.g. occupational physicians and general practitioners) should be aware of the competing demands of work and family and provide support and guidance for their employees/clients. Especially persons who are suffering from a chronic disease need additional attention.

We found considerable differences in the study variables as well as in the associations between antecedents, WFI and health-related characteristics between the men and the women. Family-related characteristics tended to be more important to the female respondents, whereas work-related characteristics played a somewhat stonger role in the male respondents. Based on this Dutch study, we recommend the use of separate analyses on men and women. When developing intervention programmes that aim to reduce work-family interference and increase (occupational) health, sex differences should be taken into consideration.

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**General discussion**





## GENERAL DISCUSSION

Over the few past decades, there have been many changes in work and family life. As from the nineteen sixties and seventies, physically demanding jobs have been replaced by more mentally demanding jobs due to mechanisation and automation (Zegers 1999). Consequently, work-related health complaints have also changed: fatigue and emotional exhaustion have become relatively more important compared to e.g. noise-induced hearing loss or musculoskeletal complaints because of heavy manual materials handling. Another change is the increased participation of women in the labour force. As women still remain chiefly responsible for household tasks and care for the children, it is believed that they suffer from a 'double burden': the burden due to being active in one's job and remaining responsible for domestic activities, including child care (Bekker et al. 1999). It has been hypothesized that the 'double burden' is an explanation for the differences in sick leave and work disability between the sexes (Van der Giezen 2000).

In the Netherlands and many other Western countries, ways and means of reducing of sick leave and work disability have formed important social and political issues for many years. Sick leave imposes considerable direct and indirect cost on employers and society (Klitzman et al. 1990; Van Deursen et al. 1999). Moreover, (long-term) sick leave may lead to reduced quality of life and financial losses for the employee. In order to take preventive measures, it is necessary to understand the determinants of sick leave. Van Deursen et al. (1999) distinguished five groups of determinants: 1) work factors, 2) non-work factors, 3) legal and executive aspects, 4) health care and 5) general societal factors. In this thesis, attention was chiefly paid to the first two categories: we focused on the relationships between work- and family-related characteristics, work-family interference, health-related characteristics and sick leave in a population of Dutch university employees.

### Explorative study

A great deal of the research into the health effects of psychosocial workload has been performed on 'blue collar' workers. In this thesis, university employees were regarded. These employees have received more education and perceive more autonomy than workers in general. Therefore, our first question was: is it possible to find associations between psychosocial work characteristics and health characteristics in a population of university employees? (*Chapter 2*). The model 'Workload' served as the theoretical framework. It is comparable with the frequently used Job Demand Control Support Model (Karasek 1979; Johnson and Hall 1988). Separate analyses were performed on the non-scientific personnel (NSP) and the scientific personnel (SP). Although some differences were found between these two groups, the differences were smaller than

we had expected. The relative lack of differences between the NSP and SP might partially be explained by the fairly good working conditions at the university and the large proportion of NSP with a higher education level.

Bültmann et al. (2001) reported that the occupational title, as a proxy index of the 'objective' work demands, adds little explanatory information beyond perceived measures of the work environment. On the other hand, the occupational title expresses dimensions that may be important in relation to health and sick leave, such as life-style factors and better health care accessibility skills (Otten et al. 1998; Aittomäki et al. 2003). Therefore, we decided to use occupational title (employment function) in other analyses in this thesis. We have created three groups: lower-educated NSP, higher-educated NSP and SP.

In the NSP and SP, positive work aspects, such as professional expertise and work variety, were strongly associated with well-being at work. Tension, emotional exhaustion and perceived health complaints were chiefly explained by negative work aspects, such as high work pressure. These findings are consistent with those presented by Janssen et al. (2004). They stated that certain job resources, such as job autonomy (or job control), skill variety and feedback, predict in particular motivational outcomes, such as job satisfaction. In contrast, job demands (e.g. cognitive, emotional and physical demands or lack of social support) are the most important predictors of adverse health outcomes, such as burnout (Janssen et al. 2004).

Our explorative study showed that a questionnaire survey was a feasible method to investigate the relationships between psychosocial workload and health in a population of university employees and that the model 'Workload' adequately described the main associations. A new questionnaire survey was conducted in which the aims were not only to assess psychosocial work characteristics, but also family-related characteristics and work-family interference. It was expected that characteristics in a person's private life and difficulties with combining work and family life would contribute to the explanation of health effects and sick leave. In 2001, we sent the questionnaire to the home addresses of all the employees at the university (N=3881). Useable responses were received from 1843 employees (net response 49.1%). The analyses described in the other chapters were performed on these data.

### **Employees with chronic diseases**

Since the end of the nineteen eighties, government policies have been making it more difficult to take early retirement and they have also been stimulating women and older employees to participate in the labour force. In addition, new laws have been introduced that aim to cut the cost of sick leave and disability pensions. Owing to

these new regulations, more persons with chronic diseases and diminished capacity form (and remain) part of the labour force (Wevers et al. 1996; Kerkhofs et al. 2000). Until now, very little attention has been paid to differences in sick leave, perceptions of working conditions and health-related characteristics between employees with chronic diseases and those without.

In our data set, 444 of the respondents (24.8%) indicated that they were suffering from at least one chronic disease (e.g. diabetes, cancer, cardio-vascular disease, psychological condition, musculoskeletal complaints, et cetera). Therefore, in *Chapter 3* and *Chapter 4*, we investigated whether there were differences in (associations between) work aspects and health between these chronically ill workers (CIWs) and the other, non-chronically ill workers (NCIW). The CIWs were found to have lower education levels and lower occupational levels. After adjustment for sex, age, employment function and hours worked weekly, the CIWs showed more perceived health complaints and higher levels of fatigue and emotional exhaustion and they had less favourable perceptions of many work-related characteristics than the NCIWs. In *Chapter 3*, it also appeared that the CIWs took sick leave twice as much frequent sick leave and for nearly three times more prolonged sick leave than the NCIWs. In the two groups, the three health aspects under study contributed more to the explanation of the sick leave outcomes than the work-related aspects, although the work-related characteristics had some effect on prolonged sick leave, especially in the NCIWs.

Based on our results reported in *Chapter 2*, we expected that the work-related characteristics would contribute indirectly to sick leave through fatigue, emotional exhaustion and perceived health complaints. Therefore, we investigated the associations between work-related characteristics and fatigue, emotional exhaustion and perceived health complaints, in the CIWs and NCIWs separately (*Chapter 4*). We could conclude that in the two groups, the negative work-related characteristics contributed most to explaining the variance in the three health-related characteristics.

In the CIWs, the explained variance in fatigue was much smaller than in the NCIWs (*Chapter 4*). Autonomy was strongly associated with fatigue in the CIW group. Initially, we expected that more autonomy would be associated with less fatigue, but the results showed a positive association. In our view, the employees who were suffering from fatigue probably made greater use of opportunities for autonomy due to their health problems. In *Chapter 3*, we found that fatigue was strongly associated with frequent sick leave. Boot (2004) reported that in employees with asthma and COPD, fatigue formed a major reason for sick leave and that more perceived control of fatigue was associated with less sick leave. Our results on work-related characteristics, fatigue and sick leave were similar and may indicate that chronically ill workers use job control or autonomy to prevent fatigue-related sick leave.

Employers and superiors should be aware that chronically ill workers need special attention and that work adjustments are crucial for them to be able to retain their employment (Wevers et al. 1996). In many cases, this does not mean that adjustments need to be made to the physical working environment, but instead, changes need to be made to the tasks in order to increase job control, lower the work pace and change the working hours. The barrier against actually using facilities is smaller when the employee knows that his/her superiors approve of this (Wevers et al. 1996; Detaille et al. 2003). The great importance of social support from superiors was partly confirmed in our study: support from superiors seemed to protect against emotional exhaustion in CIWs especially.

A matter that complicates the provision of support from superiors is that many chronically ill workers do not inform their colleagues and/or superiors about their diseases and illnesses, e.g. because they fear stigmatisation, discrimination, stereotyping and prejudice (Munir et al. 2005). We found indications for these negative consequences in our results on unpleasant treatment (*Chapter 4*): unpleasant treatment (viz. feelings of discrimination regarding sex, health, age, race, et cetera) was more strongly associated with the health-related characteristics in the CIWs than in the NCIWs. However, it is unclear whether there *is* actual more unpleasant treatment against these CIWs, or whether they *perceive* more unpleasant treatment.

In the model 'Workload', distinction is made between early signs/short-term effects and long-term health effects. The results of *Chapter 2* showed that it was possible to differentiate between various health outcomes: well-being at work seemed to be the first to diminish, then there were increases in emotional exhaustion and tension, followed by increases in perceived health complaints. When we combine the results of *Chapter 3* and *Chapter 4*, the data pointed in the same direction. Consistent with *Chapter 2*, *Chapter 4* showed that the work-related characteristics contributed to the explanation of fatigue, emotional exhaustion and perceived health complaints. In *Chapter 3*, we found that especially the health-related aspects contributed to the explanation of sick leave. Thus, it could be concluded that the health-related characteristics fatigue, emotional exhaustion and perceived health complaints were short-term effects, whereas sick leave was a long-term effect. From a longitudinal point of view, these results can be interpreted as a chain reaction in which ill health progresses in time. This was also proposed by Väänänen et al. (2003): first there is an unbearable situation at work or at home and the employee does not have the capacity to cope with the situation using his/her usual stress-reducing behaviours. Next, there are symptoms of illness, short absences from work and in the long run, sick leave is recommended by a physician. It has to be stressed that the capacities of the CIWs are already lower than those of the NCIWs and consequently, the CIWs will need to take

sick leave sooner than the NCIWs. Therefore, early intervention is very important in case of health complaints, in order to prevent (long-term) sick leave. In order for the CIWs to be able to speak up easily, the work climate and social relationships need to be receptive.

### **Work-family interference**

Although the work-related characteristics explained a fair proportion of the variance in the health-related characteristics and sick leave, it was expected that family-related characteristics and the interference between work and family would also contribute. Work-family interference (WFI) is defined as ‘a form of interrole 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.’ (Greenhaus and Beutell 1985). In *Chapter 5*, several topics were addressed in a literature review. Below we elaborate on some of the conclusions drawn in *Chapter 5* and on how we incorporated these conclusions into our studies.

### **Research models and domain-specific relationships**

With regard to the research models, it could be concluded that in most of the studies, WFI is a mediator in the relationship between work- and family-related characteristics and various outcome measures, such as well-being and health (Klitzman et al. 1990; Frone et al. 1992; Kinnunen and Mauno 1998). This means that WFI can be placed in the causal path between the antecedents (i.e. work- and family-related characteristics) and the outcomes (e.g. well-being and health-related outcomes). Therefore, antecedents are not only directly related to outcomes, but also indirectly through WFI. Klitzman et al. (1990) presented an early model that reflected the relationships between stressors at work, stressors outside work, WFI and health. However, no distinctions were made in directions of WFI. Frone et al. (1992) were among the first to take the bi-directional nature of WFI into consideration. They stated that work-related characteristics are the determinants of work→family interference (W→FI), whereas family-related characteristics contribute to family→work interference (F→WI). Furthermore, it was proposed that the effects of W→FI can especially be expected at home and that the effects of F→WI can be expected in the work situation. Many researchers have referred to this specific model when investigating the associations between antecedents and WFI scales. In several studies, however, it was found that work-related characteristics correlated with F→WI and that family-related characteristics correlated with W→FI. These additional relationships were included in

the model proposed by Kinnunen and Mauno (1998). We selected this model in particular to guide our analyses.

In *Chapter 6*, we investigated whether there was any evidence of these additional relationships in our data set. The results showed that several family-related characteristics were associated with the W→FI subscales and that the combined entry of work- and family-related characteristics explained more of the variance in these subscales than when each block was entered separately. This means that the family-related characteristics made unique, significant contributions to the explanation of the W→FI subscales. Less support was found for the F→WI subscales in the model proposed by Kinnunen and Mauno, but entry of the work-related characteristics into the regression equation of F→WI<sub>strain</sub> resulted in a small increase in the explained variance. In *Chapter 7*, some comparable results were found. Therefore, the relationships between work- and family-related characteristics and WFI dimensions are more complex than Frone and colleagues initially anticipated.

### **Six dimensions of work-family interference**

As mentioned above, a great deal of evidence has been found to support the bi-directional nature of WFI. Nowadays most researchers take W→FI and F→WI into consideration. In addition, three forms of bi-directional WFI can be distinguished: time-, strain- and behaviour-based interference. Thus, six dimensions have been described, although behaviour-based W→FI and F→WI have received far less attention than the other dimensions. We searched for measuring instruments that took the six dimensions into consideration. To the best of our knowledge, only Carlson et al. (2000) incorporated the six dimensions of WFI into their questionnaire. We translated these questions into Dutch and used them in our questionnaire to assess WFI.

In *Chapter 6*, we examined whether the six WFI dimensions have differential patterns of association with the various work- and family-related characteristics. The correlations between the WFI subscales, the proportions of explained variance and the differences in associations with the work- and family-related characteristics emphasized the need for multidimensional assessment of WFI, especially on W→FI<sub>time</sub>, F→WI<sub>time</sub>, W→FI<sub>strain</sub> and F→WI<sub>strain</sub>. We found lower proportions of explained variance in W→FI<sub>behaviour</sub> and F→WI<sub>behaviour</sub>. These two subscales correlated strongly with each other, but the patterns of association did not match exactly. As mentioned by Carlson et al. (2000), more research into the meaning of behaviour-based interference and its measurement is desirable.

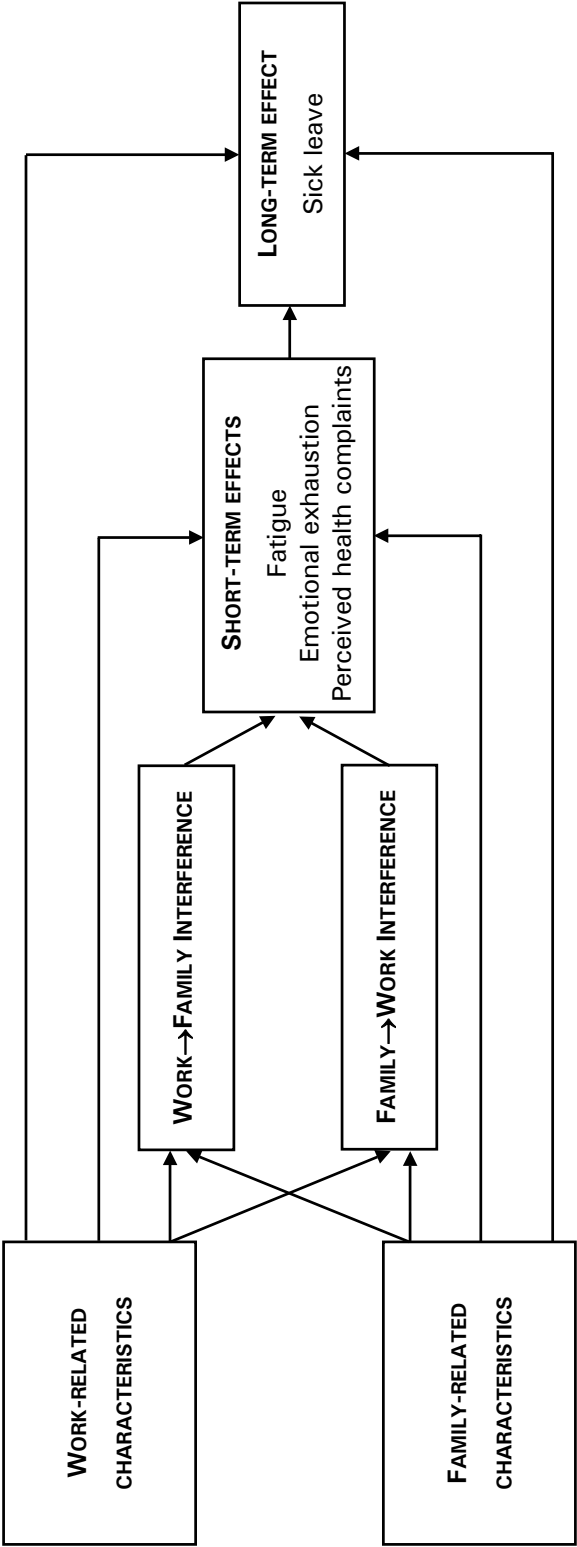
### A comprehensive model

The first three studies in this thesis indicated that health-related characteristics can be divided into early signs/short-term effects and long-term effects. From *Chapter 5*, it was learnt that WFI was generally considered as a mediator and the bi-directional nature of WFI became very clear. The analyses in *Chapter 7* were performed on all these findings and guided by a comprehensive model (Figure 1), in which the model 'Workload' (Van Dijk et al. 1990) was integrated into the model on work-family interference proposed by Kinnunen and Mauno (1998). This time, fatigue, emotional exhaustion and perceived health complaints were short-term effects or early signs of diminished health. Sick leave was considered a long-term effect.

Our study showed that in the men and women,  $W \rightarrow FI$  was directly associated with fatigue, emotional exhaustion and perceived health complaints and indirectly associated with sick leave (via perceived health complaints). Unexpectedly,  $F \rightarrow WI$  played a far less important role than  $W \rightarrow FI$ .

In the men and women, a life event in private domain in the past 12 months and the presence of chronic disease were associated with more sick leave. Such aspects cannot be influenced by an employer (as opposed to e.g. reductions in work pressure or physical workload), but employers and superiors need to acknowledge their impact.

The results showed that  $W \rightarrow FI$  had a partially mediating effect in the relationships between work and family life and ill health and sick leave: some of the work- and family-related characteristics (e.g. satisfaction with employment terms and burden of commuting) had an effect on the health aspects or sick leave only via  $W \rightarrow FI$ , whereas other characteristics (e.g. physical workload) had a direct association with the health aspects. This partial mediating role of WFI is in line with the findings reported elsewhere (e.g. Geurts et al. 1999; Janssen et al. 2004).



**Figure 1** Conceptual model of the relationships between work- and family-related characteristics, work-family interference, ill health and sick leave.



## Sex differences

Many researchers have reported differences in the working situation between men and women. In general, women occupy positions with less status, less power and fewer career opportunities than men. They often receive lower wages than men in comparable positions, more of them are victims of sexual harassment and they experience less decision latitude and autonomy and higher work pressure (Verdonk et al. 2001; Jettinghoff et al. 2004). However, men are more likely to be burdened by unfavourable physical working situations, such as noise, unpleasant odours, dirty and dangerous work and heavy manual materials handling. Besides the many differences in the working situation, there are many differences in the family domain. In Western countries, the women are socialized to give more priority to the family role. In the men, the working role is generally of more importance: being the provider is their way of taking care of their family.

Our data showed the 'traditional' inequities in the distribution of working hours, child care tasks and household chores: the men were working longer hours outside the home, while the women were spending more time on taking care of the children and the home (*Chapter 6*). Many sex-related differences were found in the various work-related characteristics. The men reported higher work pressure and more role conflict than the women. Moreover, the men took work home more often than the women. All the other significant differences indicated that the conditions were less favourable in the women than in the men (unpleasant treatment, work variety, professional skills, communication, employment terms, career opportunities, possibilities for learning, decision latitude and autonomy). Some of the differences in the family-related characteristics stemmed from differences in the age of male and female respondents: the men were generally older and consequently had older children than the women and these older children were more able to provide support to their parents. Regarding the health-related characteristics, it was found that the women reported more fatigue, emotional exhaustion, perceived health complaints and sick leave. These results are in accordance with those of other Dutch studies (Van Deursen et al. 1999; Verdonk et al. 2001; Jettinghoff et al. 2004).

In addition to differences in the scores on several study variables, we found several differences in the strength of the associations. The men showed significantly stronger associations between work pressure and satisfaction with employment terms and  $W \rightarrow FI$ , whereas the association between the age of the youngest child and  $F \rightarrow WI$  was significantly stronger in the women than in the men (*Chapter 7*). Perceived health complaints, presence of chronic disease, a life event in private domain and (need for) childcare contributed in both sexes to the explanation of sick leave. The (need for) childcare was associated with more sick leave. Especially the employees who already

had some form of childcare reported more sick leave. This association may reflect that an employee claimed to be on sick leave, but he/she actually needed to stay at home to look after a sick child. Another explanation may be that making arrangements for childcare is very stressful and therefore leads to sick leave.

Although there were similarities in the associations with sick leave between the men and women, some differences were also found: in the men, sick leave was associated with a work-related life event and the extent to which they took work home. In the women, these two work-related characteristics were not associated with sick leave, but support from the children (i.e. a family-related characteristic) seemed to protect against sick leave.

Owing to the differences in work and family roles, it has often been hypothesized that women report more F→WI, but assign greater importance to W→FI. On the other hand, it is expected that men report more W→FI but assign greater importance to F→WI. However, in many studies, no differences were found in the levels of W→FI and F→WI (e.g. Frone et al. 1992). In other studies, the women reported more WFI than the men (Cinamon and Rich 2002), whereas yet in other studies, the men experienced more WFI (Wagena and Geurts 2000). Thus, results in the literature are not very clear regarding sex differences in experiencing WFI. In our study, the men reported somewhat more W→FI, but there were no significant differences in the associations between W→FI and the health-related characteristics and sick leave (*Chapter 7*). We did not take the role saliency or beliefs about the importance of work and family roles into consideration (Cinamon and Rich 2002). Investigation of the relative importance of the work role and the family roles may lead to a better understanding of WFI.

### **Methodological considerations**

In each chapter of this thesis, we already elaborated on the weakness of the cross-sectional study design and the self-report questionnaire. Although longitudinal studies are preferred from a scientific point of view, results from cross-sectional studies can provide useful starting points for intervention studies. Selection bias cannot be totally excluded: it is possible that subjects with poor health changed to jobs with lower levels of negative work-related characteristics, reduced their working hours or even stopped working to gear work to family life better. In general, people who have paid work tend to enjoy better health than persons who do not participate in the labour force. Associations may have been underestimated because of this.

Although our questionnaire was rather comprehensive, it may not have assessed some issues in the best possible way. For example, we chiefly assessed the family-related characteristics by means of facts rather than perceived demands and role quality. The

appraisal of the combination of paid work and family responsibilities is one of the important factors related to well-being (Groenendijk 1998). Therefore, attention should be paid to the more subjective assessment of the family-related characteristics, as was the case with the work-related characteristics.

Our study population consisted of employees at a university and was therefore a rather specific group. It is possible that university employees differ from the general population in ways that affect associations between the variables investigated in this study. However, more and more jobs with high physical demands are being replaced by jobs that chiefly involve mental demands and higher levels of autonomy. Thus, there will be increasingly more workers who are comparable with our group of non-scientific personnel with higher levels of education. External validity was restricted not only because of our rather specific population, but also because of national traditions. Dutch employees may have other attitudes towards work, family life and parenthood than people in other Western countries. For example, the employment rates of women are much higher in the Nordic countries where they have highly developed childcare and family leave provisions. In the Netherlands, there is a much stronger belief that the parents should be the ones who bring up the children. This is partly why so many Dutch women work part-time. Although it still has to be confirmed whether our results can be generalised to other countries, many of the associations we found were comparable with the results reported by other research groups.

### **Recommendations for further research**

In *Chapter 5*, we described some limitations of the research into the health effects of combining paid work and caring for a family and home. In this thesis, we addressed various topics, but there are still several lacunae. Therefore, some recommendations are made for further research, without the intention of being complete.

- Our results on the presence of chronic disease showed that it is very important to take this aspect into consideration when investigating the associations between psychosocial workload and health.
- Most studies in the field of WFI focused chiefly on negative spillover and the *scarcity hypothesis*. This hypothesis states that when individuals have multiple roles, this leads to conflicts between the various roles and to higher total demands, which in turn have negative effects on well-being and health (*Chapter 5*). Far less attention has been paid to the positive effects of combining paid work and caring for a family and home. To gain a more complete understanding of the effects of combining paid work and caring, more research should focus on positive spillover and role quality (Groenendijk 1998; Grzywacz and Marks 2000; Geurts and Demerouti 2003). Positive spillover between work and family that results from

finding creative solutions to conflicting demands may prove enriching and may enable men and women to fulfil their roles in a more satisfying way (Cinamon and Rich 2002). Recently, a first attempt was made to operationalize work-family facilitation (Wagena and Geurts 2000; Grzywacz and Marks 2000).

- More qualitative measures should be included when investigating determinants and consequences of WFI. For example, in many studies, people without a partner and/or children were often considered to carry less burden. However, unintentional childlessness may be a great emotional burden, while persons without a partner may receive less emotional support and also less instrumental support. Therefore, more attention should be paid to looking for subjective demands or rewarding aspects.
- In the field of occupational health, the Job Demand Control model has had great impact (Tsutsumi and Kawakami 2004). Recently, Siegrist (1996) has proposed the model of Effort-Reward imbalance at work. This model claims that lack of reciprocity or fairness between 'cost' and 'gain', i.e. high cost but low gain, causes a state of emotional distress that can lead to adverse health outcomes (Siegrist 1996; Tsutsumi and Kawakami 2004). Tsutsumi and Kawakami (2004) reported that the Job Demand Control Support model and the Effort-Reward imbalance model identify different aspects of occupational stress and that the health effects are independent of each other. Combining these two models may result in better predictions of health outcomes than just using one (Tsutsumi and Kawakami 2004). It may be worthwhile to expand these findings to the field of work-family interference.
- The results of *Chapter 6* provided evidence of the multidimensional character of WFI. However, in order to be able to compare our results to those of others and because of the complexity of our model, we combined the time- and strain-based subscales and omitted the behaviour-based subscales from the analyses in *Chapter 7*. Some preliminary analyses (data not shown) indicated that  $W \rightarrow FI_{\text{strain}}$  is of more importance than the other WFI dimensions. This subscale was actually the only one associated with the health-related outcomes. If  $W \rightarrow FI_{\text{strain}}$  is the most important dimension of WFI, then the work- and family-related characteristics that associate most strongly with this particular dimension may be the first points of intervention to reduce WFI and its negative health effects (Loerch et al. 1989). Therefore, more research is recommended into the associations between the six WFI dimensions and health-related outcomes.
- One of the most consistent observations in the literature on multiple roles is that single parents (and single mothers in particular) have the poorest health (Chandola et al. 2004). Single parents may be more susceptible to WFI than people in dual-

earner situations, because they are likely to have higher role demands, more limited resources, greater obligations to hold down a paid job and heavier constraints on their job mobility. On the other hand, single parents may have lower family demands than married parents, because there is no interference from a partner (McManus et al. 2002). Very little research has been carried out specifically on single parents. Unfortunately, there were too few single parents in our data set to perform meaningful analyses on this specific group of employees.

- In this thesis, we focused on health-related outcomes, because sick leave is of importance to employers due to the high direct and indirect cost. Other more work-related outcomes, such as organizational commitment, intention to turnover, job performance and productivity, may also be of interest from an economical point of view (Allen et al. 2000; Tsutsumi and Kawakami 2004). However, productivity is difficult to measure in white collar employees, e.g. because these employees often work in teams with different talents and responsibilities.
- To reduce the length of our questionnaire, we did not inquire into personality characteristics, such as coping styles, Type A behaviour, neuroticism, extraversion and negative affectivity. These personality characteristics have been found to influence the relationships between work- and family related characteristics, work-family interference and health. Inclusion of these characteristics may increase our understanding of the health effects of combining paid work and family life.

### **Implications for practice**

In our study, several indications of how to improve (work-related) health or to prevent work-family interference and ill health came to the fore.

- In order to improve work-related health, it is important to pay attention to negative work-related aspects, such as higher work pressure, role conflict and unpleasant treatment and not to focus only on positive characteristics, such as job control, social support, work variety and possibilities for learning.
- Possibly preventive measures should be reflected upon before sick leave occurs. Asking an employee about health-related characteristics, such as fatigue, emotional exhaustion and perceived health complaints can reveal indications of impending sick leave.
- Occupational physicians may explicate to employees with chronic diseases that it is important to inform their superiors about their health status. Superiors will only be able to pay due consideration to difficulties at work or in the combinations of work and family life if they are ware of the situation. Programmes that teach superiors to recognize difficulties and to provide support and guidance for their employees are

inexpensive to implement and are often very effective with regard to reducing work-related ill health and sick leave.

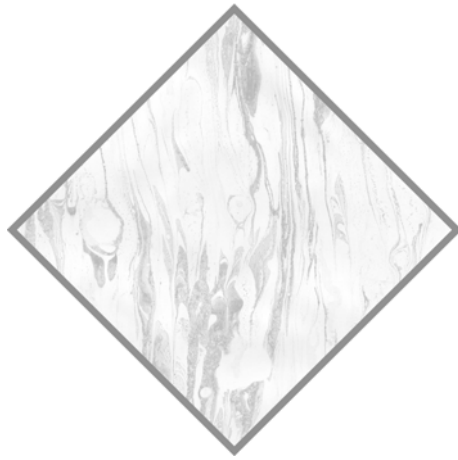
- Attention should be paid to reducing work-family interference. Reducing the burden of commuting may lead to less work-family interference. Examples of issues that have been mentioned to achieve better balance between work and family life include working hours arrangements, leave arrangements and (onsite) childcare. It has been reported that making arrangements about flexible working hours (e.g. arriving a little late or leaving a little bit early for accompany the children to and from school) is more effective than reducing the working hours. However, in our population with informal flexibility and high autonomy, it was found that the total number of hours worked weekly was associated rather strongly with W→FI.
- Occupational physicians and general practitioners need to be aware that difficulties in combining paid work and family life can lead to diminished health and sick leave. Occupational physicians play an important role in the prevention of sick leave. For example, they can explain to employees why sick leave is not the most appropriate way to deal with difficulties of any kind. In addition, they can make it clear to employers that some employees need more or specific attention, e.g. employees with chronic diseases.
- Employers should become more aware that increasing numbers of male employees want to work part-time and that this does not apply solely to female employees (Kops et al. 2004). However, in general, part-time work in men is viewed as having a damaging effect on careers. Employers need to be aware that serious job commitment is not the same as visible full-time attendance and that it is very well possible for part-time employees to make a career.
- There is still great need for professional and affordable childcare facilities. Difficulty with arranging childcare is not only an issue for employees, but it is also very much a business issue, because employees who experience the most difficulties will have the highest levels of work interruptions and absenteeism. Employers need to be aware that contributing to the cost for childcare may be a realistic way to retain skilled and enthusiastic employees.
- In the Netherlands, there are several acts and regulations that aim to facilitate combining work and family life. However, the use of these regulations in specific occasions is rather modest. Employees are often reluctant to discuss their desire to make use of these arrangements with their superiors. Therefore, superiors need to be more open about such issues.

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## **Summary**



## SUMMARY

Interest in the relationships between paid work and looking after a family has increased over the past few decades. Many researches have focused on the relationship between psychosocial workload and ill health. However, until now, little attention has been paid to the possible contribution of family-related characteristics and difficulties with combining work and family life. Therefore, we investigated whether determinants in the work- and family domains could contribute to the explanation of ill health and sick leave. For this, we obtained data from university employees with a relatively wide variety of employment functions.

The General introduction (*Chapter 1*) describes how the domains of work and family have changed over the past century. The main research questions that we have tried to answer were introduced. They are formulated as follows:

- What is the contribution of various work-related characteristics to the explanation of (psychosocial) health-related characteristics?
- Do work-related and health-related characteristics differ between employees with chronic diseases and those without chronic diseases? Are there any differences in the associations between work- and health-related characteristics and sick leave?
- What is work-family interference and how can it be assessed by means of a questionnaire?
- What is the contribution of various family-related characteristics compared to work-related characteristics in the explanation of work-family interference, health-related characteristics and sick leave?

In addition, we introduced the three themes addressed in the thesis and presented our theoretical framework.

Our first theme (*Chapter 2*) was an explorative study on the contribution of psychosocial work characteristics to the explanation of well-being at work, tension, emotional exhaustion and perceived health complaints. We used existing data obtained in 1996-1998 in the framework of occupational risk assessment among university employees (N=2522, response rate: 54%). The available questionnaire data comprised information on negative work-related characteristics (e.g. role conflict and work pressure), positive work-related characteristics (e.g. employment terms and work variety), job control (decision latitude and autonomy) and social support. Differences between the scientific personnel (SP; this concerns researchers and teachers) and the non-scientific personnel (NSP; this concerns secretaries, analysts but also managers and directors of smaller units) were investigated. Results demonstrated that the SP had more favourable scores than the NSP, especially with

regard to professional expertise, well-being at work, autonomy, work variety and career opportunities. Investigating the associations between work-related characteristics and health effects showed that the positive aspects made the largest contributions to the explanation of well-being at work. Tension, emotional exhaustion and perceived health complaints were chiefly explained by negative work aspects, such as higher work pressure. Female sex and more advanced age also contributed to the explanation of perceived health complaints. Social support contributed to the explanation of tension and emotional exhaustion in the NSP, but not in the SP. Positive aspects explained more of the variance in well-being at work in the NSP than in the SP. Based on the model 'Workload' (Van Dijk and colleagues, 1990) we expected that the four health effects would occur in phases. Our results showed that decreased well-being at work was an early effect, followed by increased tension and emotional exhaustion, and also by increased perceived health complaints.

This explorative study showed that it was possible to investigate associations between psychosocial workload and health in a population of university employees. Therefore, we constructed a new questionnaire that assessed family-related characteristics, work-family interference and sick leave in addition to the work- and health-related characteristics. In May 2001, this questionnaire was sent to all the university employees. The new data (N=1843, response rate: 49.1%) were used for the analyses in our other studies.

The second theme of this thesis concerned differences between employees with chronic diseases and those without. Ageing of the Dutch work force and increasingly stringent restrictions regarding early retirement and disability benefits are leading to larger numbers of workers with ill health. Until now, only a few studies explored how workers with ill health perceive their work. In *Chapter 3*, we investigated differences in work- and health-related characteristics between chronically ill workers (CIWs, n=444) and non-chronically ill workers (NCIW, n=1347) and whether the CIWs took more sick leave than the NCIW. The CIWs reported more perceived health complaints and higher levels of fatigue and emotional exhaustion than the NCIW. In addition, their scores on the negative work-related aspects were significantly higher than those of the NCIW, especially on physical workload and role conflict. In contrast, the CIWs reported significantly lower scores on positive work-related aspects than the NCIW. In the CIWs, the odds ratios (95% confidence interval) for more general sick leave (yes or no), frequent sick leave (>2 episodes) and prolonged sick leave (>2 weeks in total) in the past 12 months were 2.0 (1.6-2.6), 2.1 (1.5-2.9) and 2.7 (2.1-3.7), respectively. This means that the CIWs took 2-3 times more

frequent and prolonged sick leave than the NCIWs. Multiple logistic regression analyses showed that 8 to 16% of the variance in sick leave measures could be explained by health- and work-related characteristics. Fatigue, emotional exhaustion and perceived health complaints showed stronger associations with sick leave measures in the CIWs and the NCIWs than various work-related aspects.

Based on the results presented in *Chapter 2*, however, we expected that work-related characteristics would be associated with health-related characteristics. Therefore, *Chapter 4* aimed to investigate whether the CIWs and NCIWs differed regarding the associations between work-related characteristics and the three health-related characteristics. In the CIWs and NCIWs, fatigue, emotional exhaustion and perceived health complaints were chiefly associated with negative work characteristics, such as higher work pressure. However, in the CIWs, fatigue was explained to a smaller extent by work-related characteristics than in the NCIWs. Different patterns of association were found in the CIWs and NCIWs. It was concluded that the CIWs need extra support and important points for attention seem to be unpleasant treatment, autonomy, social support from superiors and possibilities for learning.

The literature and our own studies showed that work-related characteristics could only partially explain ill health and sick leave. Based on the frequent reports that women take more sick leave than men and that more women receive disability pension, we expected that family-related characteristics and difficulties with combining work and family life would also play significant roles. Work-family interference, therefore, was our third theme.

*Chapter 5* provides an overview of hypotheses on relationships between work and family issues and health issues. Various studies showed that working mothers had more general well-being and fewer health problems than 'stay at home mothers' without paid work. Thus, multiple roles does not necessarily lead to health problems. However, it has still not been fully explained why in general, women report more sick leave and working disability than men. In this chapter, we have also studied how work-family interference has been defined and which measuring instruments have proven to be useful. In 1985, Greenhaus and Beutell described work-family interference (WFI) as 'a form of interrole 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.' There is considerable evidence that WFI is bi-directional in nature, in other words, work can interfere with family life ( $W \rightarrow FI$ ) whereas family life can interfere with work ( $F \rightarrow WI$ ). Within each direction, three forms of interference

(time-, strain- and behaviour-based interference) can be distinguished, which yields six dimensions of WFI. To the best of our knowledge, only the questionnaire developed by Carlson et al. (2000) takes these six dimensions into consideration. Therefore, we chose to translate these questions and we included them in our questionnaire. In general, very little attention has been paid to behaviour-based  $W \rightarrow FI$  and  $F \rightarrow WI$ . It was also concluded that differences in perceiving WFI between men and women are far from clear.

The position of WFI in research models was also investigated. It was concluded that mostly, WFI is regarded as a mediator in the relationship between work- and family-related characteristics and various outcome measures. However, so far, very little attention has been paid to outcomes, such as health effects and sick leave. Many authors referred to the model proposed by Frone and colleagues (1992), who suggested that associations are domain-specific. This implies that work-related characteristics only correlate with  $W \rightarrow FI$  and that family-related characteristics only correlate with  $F \rightarrow WI$  only. However, there is some recent evidence showing family-related characteristics to correlate with  $W \rightarrow FI$  and work-related characteristics to correlate with  $F \rightarrow WI$ . Kinnunen and Mauno (1998) have included these additional relationships in their model.

In *Chapter 6*, our first aim was to investigate differences in the occurrence of work- and family-related characteristics and in the six subscales of WFI between the male and female university employees. It was found that the men reported more  $W \rightarrow FI_{\text{time}}$  and  $F \rightarrow WI_{\text{behaviour}}$  than the women, but there were no differences in the other four dimensions between the sexes. Furthermore, the men reported higher work pressure and more role conflict than the women and they took work home more often than the women. In contrast, the women reported less favourable conditions than the men with regard to unpleasant treatment, work variety, professional skills, communication, employment terms, career opportunities, possibilities for learning, decision latitude and autonomy. Many differences were also found in the family-related characteristics between the men and women. Some of these differences could be attributed to differences in ages: men were generally older and therefore had older children than the women. The data showed the 'traditional' inequities in the distribution of working hours, child care tasks and household chores: the men were working more hours outside the home, while the women spent more time taking care of the children and home.

Our second aim was to examine the domain-specific relationships between work- and family-related characteristics and the six subscales of WFI using multiple regression analyses with separate analyses on the men and women. The results provided

evidence in favour of the model proposed by Kinnunen and Mauno (1998) as opposed to the model presented by Frone et al. (1992). We found that various work-related characteristics were correlated with  $W \rightarrow FI$  as well as with  $F \rightarrow WI$  and that various family-related characteristics were correlated with  $F \rightarrow WI$  as well as with  $W \rightarrow FI$ .

In addition, different patterns of association were observed between work-related characteristics, family-related characteristics and the WFI subscales were found, especially in  $W \rightarrow FI_{time}$ ,  $F \rightarrow WI_{time}$ ,  $W \rightarrow FI_{strain}$  and  $F \rightarrow WI_{strain}$ . Smaller differences in association patterns were found in  $W \rightarrow FI_{behaviour}$  and  $F \rightarrow WI_{behaviour}$ . The study showed that work-family interference is a multidimensional concept with two directions ( $W \rightarrow FI$  and  $F \rightarrow WI$ ) and three forms (time, strain and behavior).

Our third objective was to investigate differences in associations between the men and women. The proportions of explained variance in the three forms of  $F \rightarrow WI$  were all higher in the women than in the men, whereas the proportions of explained variance in the three forms of  $W \rightarrow FI$  were all higher in the men than in the women.

In *Chapter 7*, we presented a comprehensive model that combined a model from the field of occupational health (model 'Workload' described by Van Dijk and colleagues in 1990) and a model from the field of work-family interference (presented by Kinnunen and Mauno in 1998). Our hypotheses were that work- and family-related characteristics have direct relationships with health-related outcomes as well as indirect relationships through WFI. In addition, we explored whether there were differences in the relationships between antecedents, WFI, ill health and sick leave between the sexes. A high proportion of the variance in  $W \rightarrow FI$  was explained by the set of antecedents in the men and the women (53% and 45%, respectively). The proportion of explained variance in  $F \rightarrow WI$  was somewhat lower (16% and 22% in the men and women, respectively). Higher work pressure and satisfaction with employment terms were more strongly associated with  $W \rightarrow FI$  in the men than in the women, whereas the age of the youngest child was more strongly associated with  $F \rightarrow WI$  in the women than in the men. Another important finding pertains to the role of WFI in association with health-related characteristics:  $W \rightarrow FI$  is strongly associated with fatigue, emotional exhaustion and perceived health complaints and contributes indirectly to the explanation of sick leave.  $F \rightarrow WI$  hardly played any role at all. Besides  $W \rightarrow FI$ , other determinants were associated with sick leave. In both sexes, perceived health complaints, a life event in private domain, (need for) childcare and the presence of chronic disease played important direct roles. There were considerable differences in the strength of the associations between the men and the women. In the women, family-related characteristics (e.g. support from the children, life event in private domain, providing family care) were more important in the explanation of sick leave,

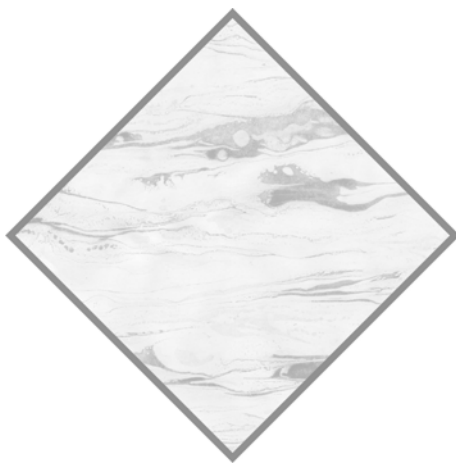
whereas work-related characteristics (e.g. a work-related life event, support from superiors, higher work pressure) were more important in the men.

In the General discussion (*Chapter 8*), the results are summarized and discussed. The main conclusions that can be drawn from our studies are as follows:

- The chronically ill workers were experiencing more difficulties at work and they reported more ill health and sick leave than the non-chronically ill workers. Therefore, employees with chronic diseases need additional attention.
- Work-family interference is a multidimensional concept, with evidence of two directions (W→FI and F→WI) and three forms (time-, strain- and behaviour-based interference).
- The relationships between work- and family-related characteristics and W→FI and F→WI were more complex than initially expected. This has implications for the complexity of research models.
- Work-family interference played a partially mediating role in sick leave and was strongly associated with fatigue, emotional exhaustion and perceived health complaints.
- We found differences in the associations between work- and family related characteristics, work-family interference, ill health and sick leave between the men and the women. These differences reflected the 'traditional' role patterns: in the women, family-related characteristics played a somewhat larger role in the explanation of WFI, ill health and sick leave, whereas in the men, the work-related characteristics appeared to be more important.

At the end of this thesis, suggestions are made for further research and we put forward several recommendations on how occupational physicians, employers and employees can reduce psychosocial workload, work-family interference and their negative health effects. Recommendations for further research chiefly pertain to more attention to positive spillover and role quality, including more qualitative family-related characteristics. Recommendations for practice regard arrangements about flexible working hours and affordable childcare facilities. More openness among both the employees and the superiors is needed in order to make combining work and care more attractive.





## **Samenvatting**



## SAMENVATTING

De laatste decennia is er toenemend aandacht voor de relatie tussen het hebben van een betaalde baan en de taken in de thuissituatie ofwel het combineren van werk en zorg. Er is veel onderzoek gedaan naar de relatie tussen gezondheidsklachten en psychosociale werkkenmerken zoals werkdruk, regelmogelijkheden en sociale steun. Tot nu toe is echter weinig aandacht besteed aan de rol van factoren in de thuissituatie en moeilijkheden bij het combineren van werk en zorg. We hebben onderzoek gedaan naar determinanten uit de werk- en thuissituatie die een bijdrage kunnen leveren aan het verklaren van gezondheidsklachten en ziekteverzuim. Hiervoor zijn gegevens gebruikt van universiteitsmedewerkers met een relatieve grote diversiteit aan functies.

In de General introduction (*Hoofdstuk 1*) worden enkele veranderingen ten aanzien van het werkdomein en het thuisdomein in de afgelopen eeuwen beschreven. Daarnaast worden de belangrijkste onderzoeksvragen gepresenteerd. Deze zijn als volgt geformuleerd:

- Wat is de bijdrage van diverse werkkenmerken aan het verklaren van (psychosociale) gezondheidsmaten?
- Zijn er verschillen in werkkenmerken en gezondheidsmaten tussen werknemers met een chronische ziekte en werknemers zonder chronische ziekte? Zijn er verschillen in de samenhang tussen werkkenmerken en gezondheidsmaten tussen deze twee groepen?
- Wat is werk-thuisinterferentie en hoe kan dit gemeten worden door middel van een vragenlijst?
- Wat is de bijdrage van diverse thuisgerelateerde kenmerken aan het verklaren van werk-thuisinterferentie, gezondheidsmaten en ziekteverzuim?

Ook hebben we de drie thema's in dit proefschrift geïntroduceerd en het theoretische model uitgelegd.

Ons eerste thema (*Hoofdstuk 2*) betrof een verkennende studie naar de bijdrage van psychosociale werkkenmerken aan het verklaren van vier gezondheidskenmerken, namelijk welbevinden in het werk, spanning, emotionele uitputting en ervaren gezondheidsklachten. Hiervoor hebben we bestaande gegevens gebruikt, die tussen 1996-1998 bij universiteitsmedewerkers zijn verzameld in het kader van een risico-inventarisatie en -evaluatie. Deze gegevens bevatte informatie over negatieve werkkenmerken (bijvoorbeeld rolconflict en werkdruk), positieve werkkenmerken (bijvoorbeeld arbeidsvoorwaarden en afwisseling), regelmogelijkheden (inspraak en autonomie) en sociale steun. We hebben gekeken of er verschillen bestonden tussen

het wetenschappelijk personeel (WP; dit zijn onderzoekers en docenten) en het niet-wetenschappelijk personeel (NWP; dit zijn secretaresses, analisten maar ook managers en directeuren van kleinere organisatieonderdelen). De resultaten lieten zien dat het WP op verschillende vragenlijstschalen een gunstigere score had dan het NWP. De verschillen waren vooral groot bij vakbekwaamheid, welbevinden in het werk, autonomie, taakafwisseling en loopbaanmogelijkheden. Onderzoek naar de samenhang tussen werkkenmerken en gezondheidskenmerken liet zien dat de positieve werkkenmerken vooral bijdroegen aan het verklaren van de uitkomstmaat welbevinden in het werk. Spanning, emotionele uitputting en ervaren gezondheidsklachten werden vooral verklaard door negatieve werkkenmerken zoals hoge werkdruk. Vrouwen en medewerkers met een hogere leeftijd ervoeren meer gezondheidsklachten. Er was een samenhang tussen sociale steun en spanning en emotionele uitputting bij het NWP, maar bij het WP werd dit niet gevonden. De positieve werkkenmerken leverden bij het NWP een grotere bijdrage aan de verklaring van welbevinden in het werk dan bij het WP. Op basis van het model 'Arbeidsbelasting' (Van Dijk en collega's, 1990) verwachtten we dat de vier gezondheidskenmerken niet tegelijk ontstaan, maar gefaseerd. De resultaten lieten zien dat bij beide groepen een afname van welbevinden in het werk een vroeg effect is, daarna ontstaat een toename van spanning en emotionele uitputting en vervolgens een toename van ervaren gezondheidsklachten.

Uit deze verkennende studie kwam naar voren dat het mogelijk was om de samenhang tussen psychosociale arbeidsbelasting en gezondheid te onderzoeken in een populatie met universiteitsmedewerkers. We hebben vervolgens een nieuwe vragenlijst gemaakt, met daarin naast vragen over werkbeleving en gezondheid ook vragen over de thuissituatie, werk-thuisinterferentie en ziekteverzuim. In mei 2001 is deze vragenlijst naar alle universiteitsmedewerkers gestuurd. Deze nieuwe gegevens (1843 respondenten, respons: 49,1%) zijn gebruikt voor de analyses in de overige studies.

Het tweede thema in dit proefschrift betrof verschillen tussen medewerkers met en zonder een chronische ziekte. Door de vergrijzing van de Nederlandse beroepsbevolking en de strengere regels voor prepensioen en WAO-uitkeringen zal het aantal werknemers met gezondheidsklachten en lagere belastbaarheid de komende jaren stijgen. Er is echter weinig onderzoek gedaan naar hoe werknemers met gezondheidsbeperkingen hun werk beleven. In *Hoofdstuk 3* hebben we verschillen in werkkenmerken en gezondheidskenmerken tussen chronisch zieke werknemers (CZW) en niet-chronisch zieke werknemers (NCZW) onderzocht. Daarnaast is onderzocht of CZW meer ziekteverzuim hadden dan NCZW. De CZW rapporteren meer

vermoeidheid, emotionele uitputting en ervaren gezondheidsklachten. Ze rapporteren hogere scores bij negatieve werkaspecten (met name fysieke belasting en rolconflict) en lagere scores bij positieve werkkenmerken. De odds ratio's (met 95% betrouwbaarheidsinterval) voor ziekteverzuim (wel of niet verzuimd), vaak verzuim (> 2 keer) en lang verzuim (> 2 weken in totaal) in de laatste twaalf maanden waren respectievelijk 2,0 (1,6-2,6), 2,1 (1,5-2,9) en 2,7 (2,1-3,7). Dit houdt in dat CZW 2-3 keer meer risico hadden op frequent verzuim en lang verzuim. Uit multiple lineaire regressie-analyses kwam naar voren dat 8 tot 16% van de variantie in ziekteverzuim kan worden verklaard door gezondheidskenmerken en werkkenmerken. Vermoeidheid, emotionele uitputting en ervaren gezondheidsklachten hadden bij zowel CZW als NCZW een sterkere relatie met de ziekteverzuimmeten dan de werkkenmerken.

Op basis van de resultaten van *Hoofdstuk 2* verwachtten we echter dat de werkkenmerken een samenhang hebben met de gezondheidskenmerken. Het doel van het onderzoek beschreven in *Hoofdstuk 4* was om te kijken of er verschillen waren tussen CZW en NCZW in die samenhang. Bij zowel de CZW als de NCZW werden vermoeidheid, emotionele uitputting en ervaren gezondheidsklachten vooral door de negatieve werkkenmerken zoals hoge werkdruk verklaard. De bijdrage van de werkkenmerken in het verklaren van vermoeidheid was bij de CZW echter beduidend lager dan bij de NCZW. Daarnaast werden tussen CZW en NCZW verschillen in samenhang tussen werkkenmerken en gezondheidskenmerken gevonden. Geconcludeerd werd dat CZW extra begeleiding nodig hebben. Aandachtspunten daarbij zijn ongewenste bejegening, autonomie, sociale steun van leidinggevende en leermogelijkheden.

De literatuur en onze eigen resultaten laten zien dat werkkenmerken maar een beperkt deel van gezondheidsklachten en ziekteverzuim kunnen verklaren. Op basis van frequente bevindingen dat vrouwen vaker verzuimen en in de WAO komen dan mannen en dat vrouwen meer verantwoordelijkheid dragen voor de thuissituatie, verwachtten we dat thuiskenmerken en moeilijkheden bij het combineren van werk en zorg ook een belangrijke rol kunnen spelen bij het verklaren van ziekteverzuim. Werk-thuisinterferentie betrof daarom het derde thema.

*Hoofdstuk 5* geeft een overzicht van in de literatuur beschreven hypothesen over de relatie tussen werk en thuissituatie en gezondheid. Uit verschillende onderzoeken blijkt dat werkende moeders meer welbevinden en minder gezondheidsproblemen rapporteren dan moeders die geen betaalde baan hebben. Het vervullen van meerdere rollen (zorgen en werken) leidt dus niet noodzakelijkerwijs tot gezondheidsproblemen. Het is echter tot op heden nog niet duidelijk waarom vrouwen vaker verzuimen wegens ziekte en vaker arbeidsongeschikt zijn dan mannen. In dit hoofdstuk is ook

beschreven hoe werk-thuisinterferentie wordt gedefinieerd en welke meetinstrumenten bruikbaar zijn gebleken. Greenhaus en Beutell hebben werk-thuisinterferentie (WTI) omschreven als 'een vorm van conflict tussen rollen waarbij de eisen uit het werk en de thuissituatie in bepaalde mate lastig met elkaar te verenigen zijn. Dit houdt in dat participatie in het werk moeilijker is door de thuissituatie, of andersom'. Het is aangetoond dat WTI twee richtingen heeft: het werk kan interfereren met de thuissituatie ( $W \rightarrow TI$ ) en de thuissituatie kan interfereren met de werksituatie ( $T \rightarrow WI$ ). Binnen elke richting kan daarnaast onderscheid worden gemaakt naar drie vormen van interferentie: tijd, spanning en gedrag. Er zijn dus zes dimensies van WTI te onderscheiden. Voor zover we hebben kunnen achterhalen, komt dit onderscheid alleen terug in de vragenlijst die door Carlson en collega's (2000) is ontwikkeld. Daarom hebben we ervoor gekozen om deze te vertalen en in onze vragenlijst op te nemen. In het algemeen wordt heel weinig aandacht besteed aan gedraggebaseerde  $W \rightarrow TI$  en  $T \rightarrow WI$ . Ook werd geconcludeerd dat man-vrouw verschillen in het ervaren van WTI nog niet duidelijk zijn.

Ook is de plaats van WTI in onderzoeksmodellen onderzocht. We concludeerden dat WTI meestal wordt gezien als een mediator tussen de werk- en thuiskenmerken en verschillende uitkomsten. Daarbij blijkt dat tot nu toe weinig aandacht is besteed aan gezondheidsaspecten en ziekteverzuim. Veel auteurs gebruiken het model beschreven door Frone en collega's (1992). Deze auteurs gaven aan dat de samenhang tussen determinanten en WTI domeinspecifiek is. Dit betekent dat werkkenmerken alleen zouden samenhangen met  $W \rightarrow TI$  en dat thuiskenmerken alleen zouden samenhangen met  $T \rightarrow WI$ . In de literatuur zijn echter ook resultaten beschreven die aangeven dat thuiskenmerken met  $W \rightarrow TI$  kunnen samenhangen en dat werkkenmerken met  $T \rightarrow WI$  kunnen samenhangen. Deze aanvullende relaties zijn door Kinnunen en Mauno (1998) in hun model opgenomen.

Naar aanleiding van het literatuuroverzicht hebben we de samenhang tussen werksituatie, thuissituatie en werk-thuisinterferentie onderzocht met behulp van onze vragenlijstgegevens. Het eerste doel in *Hoofdstuk 6* was te bekijken wat de verschillen zijn in de werkkenmerken, de thuiskenmerken en de zes WTI subschalen tussen mannelijke en vrouwelijke medewerkers. Het bleek dat mannen meer  $W \rightarrow TI_{tijd}$  en  $T \rightarrow WI_{gedrag}$  rapporteerden dan vrouwen, maar dat geen verschillen in de andere vier dimensies werden gevonden. Daarnaast rapporteerden mannen een hogere werkdruk en meer rolconflict dan vrouwen en ze gaven aan vaker werk mee naar huis te nemen. Vrouwen rapporteerden ongunstigere omstandigheden ten aanzien van ongewenste bejegening, taakafwisseling, vakbekwaamheid, communicatie, arbeidsvoorwaarden, loopbaanmogelijkheden, leermogelijkheden, inspraak en autonomie. Ook werden verschillen in de thuiskenmerken gevonden tussen mannen en vrouwen. Een aantal

van deze verschillen komt door een verschil in leeftijd: mannen waren gemiddeld ouder en hadden daardoor ook oudere kinderen. Uit de gegevens komt een 'traditioneel' rollenpatroon ten aanzien van betaald werk en zorgtaken naar voren: de mannen werken meer uren in een betaalde baan en de vrouwen besteden meer tijd aan zorg voor de kinderen en huishouden.

Het tweede doel was het onderzoeken van de domeinspecifieke samenhang tussen de werkkenmerken en thuiskenmerken en de zes WTI subschalen. Dit is voor mannen en vrouwen apart gedaan met multiple lineaire regressie analyses. De resultaten sloten het beste aan bij het model van Kinnunen en Mauno (1998): we vonden dat diverse werkkenmerken een samenhang hadden met zowel  $W \rightarrow TI$  subschalen als met  $T \rightarrow WI$  subschalen en eveneens dat diverse thuiskenmerken een samenhang hadden met zowel  $T \rightarrow WI$  subschalen als met  $W \rightarrow TI$  subschalen. Daarnaast vonden we verschillende patronen in de samenhang tussen werkkenmerken en thuiskenmerken en de WTI subschalen, vooral bij  $W \rightarrow TI_{tijd}$ ,  $T \rightarrow WI_{tijd}$ ,  $W \rightarrow TI_{spanning}$  en  $T \rightarrow WI_{spanning}$ . Bij  $W \rightarrow TI_{gedrag}$  en  $T \rightarrow WI_{gedrag}$  waren de verschillen in samenhangpatronen minder groot. Uit de analyses kwam duidelijk naar voren dat werk-thuisinterferentie een multidimensioneel concept is met twee richtingen ( $W \rightarrow TI$  en  $T \rightarrow WI$ ) en drie vormen (tijd, spanning en gedrag).

Het derde doel was de verschillen in de samenhang tussen de mannen en vrouwen. De percentages verklaarde variantie in de drie vormen van  $T \rightarrow WI$  waren hoger bij de vrouwen dan bij de mannen, terwijl de percentages verklaarde variantie in de drie vormen van  $W \rightarrow TI$  bij de mannen hoger waren dan bij de vrouwen.

In *Hoofdstuk 7* hebben we een uitgebreid model beschreven waarin een model uit de bedrijfsgezondheidszorg (model 'Arbeidsbelasting' beschreven door Van Dijk en collega's in 1990) en een model uit het werkveld van werk-thuisinterferentie (gepresenteerd door Kinnunen en Mauno in 1998) werden gecombineerd. Onze hypothesen waren dat de werkkenmerken en de thuiskenmerken zowel direct zouden samenhangen met de gezondheidsmaten als indirect via WTI. Daarnaast hebben we gekeken of er verschillen tussen mannen en vrouwen optraden in de samenhang tussen determinanten, WTI en gezondheidsproblemen en ziekteverzuim. Zowel bij de mannen als de vrouwen zorgden de determinanten voor een hoog percentage verklaarde variantie van  $W \rightarrow TI$  (respectievelijk 53% en 45%). Het percentage verklaarde variantie in  $T \rightarrow WI$  was wat lager (16% voor de mannen en 22% voor de vrouwen). De samenhang van hoge werkdruk en tevredenheid met arbeidsvoorwaarden met  $W \rightarrow TI$  was bij de mannen duidelijk sterker dan bij de vrouwen, terwijl bij de vrouwen een sterkere samenhang tussen de leeftijd van het jongste kind en  $T \rightarrow WI$  werd gevonden dan bij de mannen. Een andere belangrijke

bevinding betreft de samenhang tussen WTI en de gezondheidsmaten:  $W \rightarrow TI$  heeft een sterke samenhang met vermoeidheid, emotionele uitputting en ervaren gezondheidsklachten en draagt indirect bij aan het verklaren van ziekteverzuim.  $T \rightarrow WI$  speelde echter nauwelijks een rol. Naast  $W \rightarrow TI$  zijn er andere determinanten van ziekteverzuim gevonden. Bij zowel mannen als vrouwen droegen ervaren gezondheidsklachten, een emotionele gebeurtenis in het privé-leven, (behoefte aan) kinderopvang en het hebben van een chronische ziekte direct bij aan het verklaren van ziekteverzuim. Er zijn aanzienlijke verschillen gevonden in de sterkte van de samenhang tussen de mannen en de vrouwen. Bij de vrouwen bleken de thuiskenmerken (bijvoorbeeld steun van de kinderen, een emotionele gebeurtenis in het privé-leven, mantelzorg verlenen) belangrijker bij het verklaren van ziekteverzuim, terwijl bij de mannen de werkkenmerken (bijvoorbeeld een emotionele gebeurtenis op het werk, steun van de leidinggevende, hoge werkdruk) belangrijker waren.

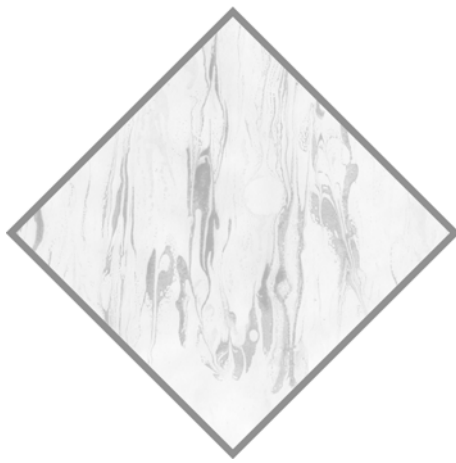
In de General discussion (*Hoofdstuk 8*) zijn de resultaten van onze studies samengevat en bediscussieerd. De belangrijkste conclusies die uit het onderzoek naar voren komen zijn:

- Chronisch zieke werknemers ervaren meer problemen in het werk en ze rapporteren meer gezondheidsproblemen en ziekteverzuim dan niet-chronisch zieke werknemers. Werknemers met een chronische ziekte hebben daarom extra begeleiding nodig.
- Werk-thuisinterferentie is een multidimensioneel concept waarbij is aangetoond dat er twee richtingen ( $W \rightarrow TI$  en  $T \rightarrow WI$ ) en drie vormen (tijd, spanning en gedrag) zijn.
- De samenhang tussen werkkenmerken en thuiskenmerken aan de ene kant en  $W \rightarrow TI$  en  $T \rightarrow WI$  aan de andere kant waren complexer dan aanvankelijk verwacht. Dit heeft implicaties voor de complexiteit van onderzoeksmodellen.
- Werk-thuisinterferentie speelt een partieel mediërende rol bij ziekteverzuim en heeft een sterke samenhang met vermoeidheid, emotionele uitputting en ervaren gezondheidsklachten.
- We vonden verschillen in de samenhang tussen werkkenmerken, thuiskenmerken, gezondheidsproblemen en ziekteverzuim tussen de mannelijke en de vrouwelijke werknemers. Deze verschillen weerspiegelden het 'traditionele' rollenpatroon: bij de vrouwen speelden de thuiskenmerken een wat grotere rol bij het verklaren van WTI, gezondheidsproblemen en ziekteverzuim, terwijl de werkkenmerken bij de mannen een grotere rol speelden.



Ter afsluiting van dit proefschrift worden suggesties voor verder onderzoek gedaan en worden aanbevelingen gedaan hoe bedrijfsartsen, werkgevers en werknemers psychosociale arbeidsbelasting, werk-thuisinterferentie en hun negatieve gezondheidseffecten kunnen worden gereduceerd. Bij verder onderzoek is het van belang om positieve aspecten van combineren van werk en zorg te bekijken en meer nadruk op de kwaliteit van de partner- en ouderrol te leggen. Aanbevelingen voor werkgevers en werknemers zijn meer flexibiliteit in werkuren, goede en betaalbare kinderopvang en meer openheid onderling over wat nodig is om combineren van werken en zorgen nog aantrekkelijker te maken.





## **List of publications**



## LIST OF PUBLICATIONS

### Original articles related to this thesis

- Donders NCGM, Gulden JWJ van der, Furer JW, Tax B, Roscam Abbing EW. Werkstress en gezondheidseffecten bij universitair personeel. *Tijdschr Gezondheidswet* 2002;80(2):100-109.
- Donders NCGM, Gulden JWJ van der, Furer JW, Tax B, Roscam Abbing EW. Work stress and health effect among university personnel. *Int Arch Occup Environ Health* 2003;76(8):605-613.
- Donders NCGM, Gulden JWJ van der, Furer JW, Tax B, Roscam Abbing EW. Werkthuisinterferentie. Een literatuuronderzoek naar meetinstrumenten en onderzoeksmodellen bij het combineren van werk en zorg. *Tijdschr Gezondheidswet* 2003;81(8):473-482.
- Donders NCGM, Roskes K, Gulden JWJ van der. Vermoeidheid, emotionele uitputting en ervaren gezondheidsklachten in relatie tot werkaspecten bij werknemers met en zonder chronische ziekte. *Tijdschr Gezondheidswet* 2005;83(1):25-34
- Roskes K, Donders NCGM, Gulden JWJ van der. Health-related and work-related aspects associated with sick leave: a comparison of chronically ill and non-chronically ill workers. *Int Arch Occup Environ Health* 2005;78(3):270-278

### Submitted papers

- Donders NCGM, Furer JW, Gulden JWJ van der, Tax B, Roscam Abbing EW. Work- and family-related characteristics associated with six dimensions of work-family interference.
- Donders NCGM, Gulden JWJ van der, Furer JW, Bor JHJ, Tax B, Roscam Abbing EW. Does combining work and family issues form a risk factor for sick leave? Antecedents and outcomes of work-family interference in Dutch university employees.

### Other publications

- Donders NCGM, Hoozemans MJM, van der Beek AJ, Frings-Dresen MHW, Gulden JWJ van der. Duwen en trekken van rollend materieel. *Tijdschrift voor Ergonomie* 1997;22 (aug):102-107.
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- Donders NCGM. De beroepsbevolking in verandering. Lang leve de diversiteit? [symposiumverslag]. *Tijdschr Gezondheidswet* 2004;82(5):334-335
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- Van der Beek AJ, Hoozemans MJM, Frings-Dresen MHW, Donders NCGM. Assessment of push and pull forces exerted by construction workers. *Proceedings of the 3rd International Scientific Conference on Prevention of Work-related Musculoskeletal Disorders and the 13th International Symposium on Epidemiology in Occupational Health PREMUS-ISEOH '98*. Helsinki: Finnish Institute of Occupational Health, 1998:10.
- Donders NCGM, Gulden JWJ van der, Roscam Abbing EW. Geslachtsverschillen bij gecombineerde belasting in arbeids- en thuissituatie. *Tijdschr Gezondheidswet* 2002;80:NPHC: 16
- Donders NCGM, Gulden JWJ van der, Furer JW, Bor JHJ, Roscam Abbing EW. Werk-thuisinterferentie als determinant van ziekteverzuim bij universitaire medewerkers. *Tijdschr Gezondheidswet* 2005;83:NCVG: 50.



**Dankwoord**





## DANKWOORD

‘Wetenschappelijk onderzoek lijkt me niets voor mij’ is een uitspraak die ik tegen het einde van mijn studie vaak heb gedaan. Tijdens mijn afstudeerstage ontdekte ik dat het toch leuker was dan ik aanvankelijk dacht, maar na afloop was ik nog steeds van plan een andere weg in te slaan.

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Het onderzoek had natuurlijk niet kunnen worden uitgevoerd zonder de bijdrage van alle medewerkers van de Radboud Universiteit (voorheen de Katholieke Universiteit Nijmegen), die ervoor gezorgd hebben dat ik een mooie set met gegevens kreeg.

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Albers, Erik Bischoff, Lieke Franke, Linda Mans, Lotte van den Nieuwenhof, Tjard Schermer en Koos van der Velden wil ik hierbij noemen. Wim Gorgels dank ik voor de vrijdagse 'eat-valuations'. Petra Verdonk, ik vond het erg plezierig dat je zo enthousiast kon meedenken over mijn onderzoek.

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Een aantal mensen heeft niet bijgedragen aan mijn onderzoek, maar ik wil ze hier toch graag noemen voor hun hulp bij het onderwijs. Anke Boumans, Cora Klaver, Anneke Nieuwland en Truus Teunissen wil ik danken voor de prettige samenwerking en de extra uitleg over de praktijk als de theorie tekort schiet.

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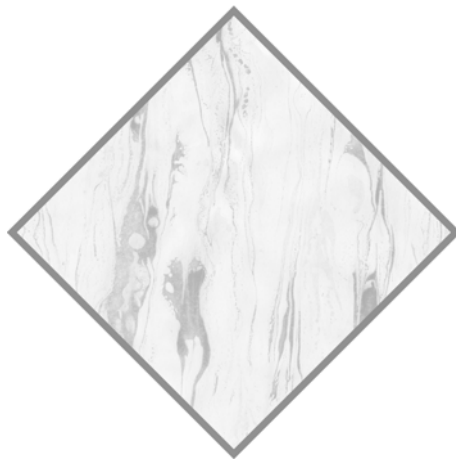
Meeke & Göran, bedankt ook voor het vertrouwen in mijn oppaskwaliteiten.

Casper, Christine, Eric, Gabe, Majon, Maroeska, Miriam, Sanne en Tommy: er komt langzaamaan een eind aan de promotiefeestjes. Maar ik heb goede hoop dat de kerstdiners nog lang niet over zijn!

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## **Curriculum vitae**



**CURRICULUM VITAE**

Nathalie Donders werd geboren op 4 januari 1972 in Oss, maar groeide op in Nijmegen en Tilburg. Ze behaalde het Atheneum B-diploma aan het St Odulphus Lyceum te Tilburg in 1991. Aansluitend begon zij met de studie (Biomedische) Gezondheidswetenschappen aan de Katholieke Universiteit Nijmegen (KUN). Vanwege de interesse in Bewegingswetenschappen en Arbeid & Gezondheid werden stages gezocht op het gebied van fysieke belasting in het werk. De kleine stage werd gelopen bij ArboUnie Zuidoost Nederland in Boxmeer (begeleiding: mw. drs.ing. JG Willems). Bij het Coronel Instituut voor Arbeid, Gezondheid en Milieu, AMC/UvA werd de afstudeerstage verricht (begeleiding: dr MJM Hoozemans, dr AJ van der Beek en mw. Prof.dr MHW Frings-Dresen). Ze voltooide de studie in september 1996. In de tweede helft van 1997 was ze verbonden aan de sectie Arbeids- en Bedrijfsgeneeskunde, afdeling Sociale Geneeskunde van de KUN. Daar voerde ze eerst literatuuronderzoek uit naar de validiteit van vragenlijsten en interviews om beroepsmatige blootstelling aan chemische stoffen te achterhalen. Aansluitend werd ze drie maanden aangesteld als juniordocent om de interfacultaire cursus 'Perceptie van (arbeids)milieu en Gezondheid' op te zetten. In oktober 1997 werkte ze ook bij het Coronel Instituut aan twee korte projecten op het gebied van duwen en trekken. In november 1997 begon ze als wetenschappelijk medewerker bij de afdeling Biomedische Natuurkunde en Technologie van de Erasmus Universiteit Rotterdam. Daar werkte ze aan een project met als doel een oefenapparaat met geïntegreerde meetmogelijkheden te ontwikkelen in het kader van 'evidence based' fysiotherapeutisch handelen. Na bijna anderhalf jaar als 'echte' bewegingswetenschapper te hebben gewerkt, bleek de interesse naar Arbeid & Gezondheid toch veel groter. In maart 1999 keerde ze daarom terug bij Sociale Geneeskunde van het UMC St Radboud, als junioronderzoeker op een onderzoek naar gezondheidseffecten van het combineren van buitenshuis werken en zorgtaken thuis ofwel werk-thuisinterferentie. De resultaten van het onderzoek zijn beschreven in dit proefschrift. Daarnaast gaf ze onderwijs op gebied van Arbeid & Gezondheid binnen Biomedische Wetenschappen, Geneeskunde en de Nijmeegse Bedrijfsartsenopleiding-SGBO. Vanaf juni 2005 is zij parttime als postdoc aangesteld bij de afdeling Metamedica van het VU medisch centrum. Daar houdt ze zich bezig met onderzoek naar de beeldvorming rond genetische informatie en alcoholisme. Vanaf augustus 2005 is ze daarnaast weer aangesteld bij de afdeling Sociale Geneeskunde van het UMC St Radboud als docent en onderzoeker.

## STELLINGEN

behorend bij het proefschrift

### **Psychosocial workload, work-family interference and health Determinants of sick leave in university employees**

1. Werk-thuisinterferentie is een belangrijke determinant van ziekteverzuim en gezondheidsproblemen. *(dit proefschrift)*
2. Werk-thuisinterferentie is een multidimensioneel concept, dat breder is dan wat werk in je tas stoppen om thuis nog iets af te maken. *(dit proefschrift)*
3. Bij werknemers met een chronische ziekte is de samenhang tussen werkkenmerken en vermoeidheid anders dan bij gezonde werknemers. *(dit proefschrift)*
4. Bij onderzoek naar gezondheid en ziekteverzuim dient het vragen naar het hebben van een chronische ziekte net zo standaard te worden als het vragen naar geslacht en leeftijd. *(dit proefschrift)*
5. Uit de associatie tussen meer steun van de kinderen en minder ziekteverzuim bij vrouwelijke universiteitsmedewerkers valt af te leiden dat het combineren van werken en zorgen ook positieve kanten heeft. *(dit proefschrift)*
6. Work-family issues are clearly family issues, not just women's issues. (Families and Work Institute 2002, *dit proefschrift*)



7. Bewegen is gezond, maar gezondheid is van meer factoren dan alleen bewegen afhankelijk. (februari 1999 bij afscheid BNT, *dit proefschrift*)
8. Het is aan te bevelen om promovendi een werkkamer met uitzicht op het westen te geven: 's avonds lang doorwerken is minder vervelend als je naar prachtige zonsondergangen kunt kijken.
9. Aangezien iedereen graag én leuk werk, én een goede gezondheid wil hebben, is het merkwaardig dat er in het algemeen maar weinig interesse is voor de relatie tussen arbeid en gezondheid.
10. Het zinnetje '60 jaar vrede in Europa' in de reclamespot over de Dag van Europa (mei 2005) doet ernstig onrecht aan de slachtoffers van de Balkanoorlog.
11. Dat twee familieleden met dezelfde voorouders als een beroemde Utrechtse hoogleraar uit de 19<sup>e</sup> eeuw hun proefschrift op dezelfde dag verdedigen, zal wel geen toeval zijn.

Nathalie Donders  
1 december 2005