

Provided for non-commercial research and education use.  
Not for reproduction, distribution or commercial use.



This article appeared in a journal published by Elsevier. The attached copy is furnished to the author for internal non-commercial research and education use, including for instruction at the authors institution and sharing with colleagues.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

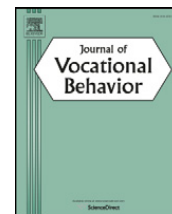
In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/copyright>



Contents lists available at ScienceDirect

## Journal of Vocational Behavior

journal homepage: [www.elsevier.com/locate/jvb](http://www.elsevier.com/locate/jvb)

## Applying the job demands–resources model to the work–home interface: A study among medical residents and their partners

Arnold B. Bakker<sup>a,\*</sup>, Lieke L. ten Brummelhuis<sup>a</sup>, Jelle T. Prins<sup>b</sup>, Frank M.M.A. van der Heijden<sup>c</sup>

<sup>a</sup> Erasmus University Rotterdam, The Netherlands

<sup>b</sup> Dutch Doctors' Association (Artsen Stichting Nederland, ASN), The Netherlands

<sup>c</sup> Vincent van Gogh Institute for Psychiatry, Venray, The Netherlands

## ARTICLE INFO

## Article history:

Received 7 October 2010

Available online 16 December 2010

## Keywords:

Buffer hypothesis

JD-R model

Job demands

Job resources

Spillover

Work–family interface

## ABSTRACT

Work–home interference (WHI) is a prevalent problem because most employees have substantial family responsibilities on top of their work demands. The present study hypothesized that high job demands in combination with low job resources contribute to WHI. The job demands–resources (JD-R) model was used as a theoretical framework. Using a sample of 230 medical residents and their partners, our results show that the combination of high job demands (i.e., work overload, emotional and cognitive demands) and low job resources (i.e., participation in decision making, supervisory coaching, feedback, and opportunities for development) was positively related to partner ratings of the employee's WHI. When job resources were high, most job demands were not related to WHI. These findings show that the JD-R model is a conceptual framework that can be fruitfully applied to the work–family interface, adding to our understanding of which particular job designs facilitate or prevent work–home interference.

© 2010 Elsevier Inc. All rights reserved.

A growing number of individuals are challenged by combining substantial domestic responsibilities and work obligations (Allen, Herst, Bruck, & Sutton, 2000; Glass & Finley, 2002). This challenge may become a stressor when "... role pressures from the work and family domains are mutually incompatible in some respect" (Greenhaus & Beutell, 1985; p. 77). For example, research by Galinsky, Bond, and Friedman (1993) indicates that a considerable proportion (40%) of employed parents experiences problems combining work and family demands; this is often referred to as work–family conflict or negative work–home interference (WHI). Frone, Russell, and Cooper (1992) found that 'work interfering with home' is most often reported by employees, while 'home interfering with work' is somewhat less common. Negative WHI has been associated with serious consequences, including depression, psychosomatic complaints, and reduced marital satisfaction (Allen et al., 2000; Eby, Casper, Lockwood, Bordeaux, & Brinley, 2005). The present study focuses on and examines potential antecedents of negative WHI in light of its high prevalence and significance (Galinsky et al., 1993; SCP, 2008).

Work–family studies have convincingly identified work overload as a key antecedent of WHI (Byron, 2005; Eby et al., 2005). Long work hours, working overtime, and pressure at the job are strong predictors of WHI (Bakker & Geurts, 2004; Demerouti, Bakker, & Bulters, 2004; Grzywacz & Marks, 2000; Voydanoff, 2004). In response to this, possible solutions for WHI have been widely explored. Social support, flexibility in work schedules, and family-friendly policies are the most commonly mentioned factors reducing WHI (for overviews, see Brough & O'Driscoll, 2010; Gajendran & Harrison, 2007; Glass & Finley, 2002). Surprisingly enough, studies examining which particular job designs lead to more or less WHI are lacking. 'Job design' refers to the

\* Corresponding author. Erasmus University Rotterdam, Institute of Psychology, Woudestein, T12-47, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands. Fax: +31 10 408 9009.

E-mail address: [bakker@fsw.eur.nl](mailto:bakker@fsw.eur.nl) (A.B. Bakker).

particular combination of job demands (e.g., work overload and cognitive demands) and job resources (e.g., job autonomy and opportunities for development). It seems that solutions for WHI are already sought even though the exact problem has not yet been depicted in detail. Therefore, this study examines which particular job designs increase or decrease WHI.

Another important limitation within the work–family field is that researchers have not based their hypotheses about negative WHI on strong conceptual frameworks (cf., Grandey & Cropanzano, 1999). Where conceptual frameworks are used, researchers have relied mainly upon role stress theory (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964), postulating that participation in one role makes it more difficult to participate in another role (Greenhaus & Beutell, 1985). From this perspective, however, it remains unclear how combinations of job characteristics (e.g., heavy work load and limited supervisor support) are related to WHI. For example, Parasuraman and Simmers (2001) found that high job involvement was positively related to WHI among respondents employed by an organization but not among self-employed respondents. Similarly, previous studies showed mixed findings on the relationship between job resources and WHI. Whereas most studies reported that job control and flexibility in scheduling reduce WHI (Butler, Grzywacz, Bass, & Linney, 2005; Brough & O'Driscoll, 2010; Heponiemi, Elovainio, Pekkarinen, & Sinervo, 2008), a study on stockbrokers found that brokers who were granted scheduling flexibility and autonomy experienced more work–family conflicts (Blair-Loy, 2009). Moreover, other studies could not find a significant effect of job autonomy (Janssen, Peeters, De Jonge, Houkes, & Tummers, 2004), learning opportunities (Voydanoff, 2004), or social support from colleagues (Van Daalen, Willemsen, & Sanders, 2006) on WHI. Taken together, previous studies have produced mixed findings on the main effects of job demands and resources on WHI and have thus far failed to identify when job demands particularly increase WHI or when job resources particularly reduce WHI. These inconsistent findings emphasize the importance of using a clear theoretical framework that takes into account possible job demands and job resources in an integral way (Grandey & Cropanzano, 1999).

The current study uses the job demands–resources (JD-R) model (Bakker & Demerouti, 2007; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) as a theoretical framework. The JD-R model was originally designed to explain which combination of job demands and job resources influences job-related well-being (e.g., burnout and work engagement). We propose that the JD-R model is also suitable for explaining stress reactions beyond the organizational border (i.e., WHI) now that the work and family domain have become inextricably bound to each other (Voydanoff, 2005). The central aim of this study is to explore the relationship between combinations of job demands and job resources on the one hand and WHI on the other.

### The job demands–resources model

At the heart of the JD-R model (Bakker & Demerouti, 2007; Demerouti et al., 2001) lies the assumption that job characteristics of every occupation can be classified into two general categories—job demands and job resources. Categorizing job characteristics into job demands and job resources results in an overarching model that may be applied to various occupational settings, irrespective of the particular demands and resources involved. *Job demands* refer to those physical, social or organizational aspects of the job that require sustained physical and/or mental effort and are therefore associated with certain physiological and psychological costs. Examples of job demands are work pressure, dealing with demanding clients, or encountering situations that affect the employee emotionally (Demerouti et al., 2001). *Job resources* refer to those physical, psychological, social, or organizational aspects of the job that (1) are functional in achieving work goals; (2) reduce job demands and the associated physiological and psychological costs; or (3) stimulate personal growth and development. Examples of job resources are autonomy in scheduling work tasks, feedback from the supervisor, and social support from co-workers (Demerouti et al., 2001).

A second assumption in the JD-R model is that job stress or burnout develops when job demands (e.g., work overload and cognitive demands) are high and when job resources (e.g., autonomy and feedback) are limited (Demerouti et al., 2001). Previous studies have shown that badly designed jobs or high job demands exhaust employees' mental and physical resources and therefore lead to exhaustion and health problems (e.g., Bakker, Demerouti, & Schaufeli, 2003; Demerouti et al., 2001).

A crucial hypothesis proposed by the JD-R model is that job resources may *buffer* the harmful impact of job demands on well-being, including burnout (Bakker, Demerouti, Taris, Schaufeli, & Schreurs, 2003) and work engagement (Bakker, Hakanen, Demerouti, & Xanthopoulou, 2007; Hakanen, Bakker, & Demerouti, 2005). This assumption of the JD-R model is consistent with the demand–control model (DCM; Karasek, 1979, 1998), but expands this model by claiming that several *different* job resources can play the role of buffer for several *different* job demands. Which job demands and resources play a role in certain organizations depends upon the specific job characteristics that prevail. Thus, whereas the DCM states that control over the execution of tasks (autonomy) may buffer the impact of work overload on job strain, the JD-R model expands this view by stating that various types of job demands and job resources may interact in predicting strain. This proposition is consistent with Diener and Fujita's (1995) findings that there are many potential resources that can facilitate the achievement of a specific goal or demand, implying that different goals or demands are likely to be influenced by several resources.

Empirical studies have provided ample support for the buffer hypothesis of the JD-R model (for an overview, see Bakker & Demerouti, 2008). Bakker, Demerouti, and Euwema (2005) found in a study among teachers that autonomy, social support, having a good relationship with one's supervisor, and feedback all attenuated the harmful effects of job demands (i.e., work overload and emotional demands) on burnout. Similarly, Xanthopoulou et al. (2007) reported that the positive relationship between job demands and burnout was less severe when employees had access to social support, feedback, opportunities for development and job control. The same results have been found for work engagement. The negative relationship between job demands and work engagement was less pronounced, or even absent, when employees had supervisor support, rewarding contacts with clients or colleagues, opportunities to innovate, and variability in tasks (Bakker et al., 2007; Hakanen et al., 2005).

It should be noted that some researchers have argued and have shown that job resources only buffer the undesirable effect of job demands when the type of job resources and job demands 'match' (De Jonge & Dormann, 2006; Frese, 1999). According to the *matching hypothesis*, emotional resources only help reduce the undesirable effects of emotional job demands, whereas physical and cognitive resources are beneficial for preventing stress due to physical workload and cognitive demands, respectively. A theoretical argument against this idea is provided by conservation of resources (COR) theory (Hobfoll, 2002), which suggests that resources can generate other resources. For example, supervisor support at work (a job resource) may enhance employee self-esteem (a personal resource). This personal resource facilitates one's ability to deal effectively with a wide variety of job demands, such as working more efficiently and dealing with clients. Findings from several empirical studies are consistent with this idea (Bakker et al., 2005; 2007; Bakker, Van Veldhoven, & Xanthopoulou, 2010; Hakanen et al., 2005; Xanthopoulou et al., 2007). Although those studies with the JD-R model do not support the matching hypothesis, they offer overwhelming support for the assertion that any job resource can buffer the impact of any job demand.

## The present study

The central hypothesis tested in this study among Dutch medical residents is that the combination of high job demands and low job resources is predictive of work-home interference. The proposed interaction will be tested using three demands and five resources that are characteristic for the organizational setting of the current study. According to the project team (including doctors and researchers), the crucial job demands in the setting used in this study were work overload, emotional demands, and cognitive demands. Note that these demands (and the resources discussed below) have also been found to be important in other occupational groups (see Bakker & Demerouti, 2007).

As suggested by the JD-R model, high job demands increase WHI due to depletion of personal resources such as time and physical and emotional energy (Bakker, Demerouti, & Schaufeli, 2003; Bakker, Demerouti, & Verbeke, 2004). Empirical studies consistently confirm the expected positive relationship between work overload and work-family conflict (e.g., Butler et al., 2005; Heponiemi et al., 2008). In line with these studies, we assume that several job demands, including work overload, emotional demands, and cognitive demands increase WHI. *Work overload* refers to the extent to which the employee needs to do a lot of tasks in a short timeframe. *Emotional demands* are issues at work that affect the employee personally and are emotionally draining (e.g., an angry patient), whereas *cognitive demands* are tasks that require a lot of concentration (Demerouti et al., 2001).

Autonomy, participation in decision making, opportunities for development, quality of the relationship with the supervisor, and performance feedback were mentioned as potential job resources. It has been argued that job *autonomy* is crucial for the health of employees, mainly because greater autonomy is associated with more opportunities to cope with stressful situations (see Jenkins, 1991; Karasek, 1998). In our study, job autonomy means independence from other persons while carrying out tasks on the one hand and decision latitude concerning one's work pace and phases on the other. Several studies with the DCM have indeed confirmed that autonomy may act as a buffer against the influence of job demands on psychological distress (Bakker et al., 2005; see Van der Doef & Maes, 1999 for an overview).

*Participation in decision making* refers to the employee's influence on higher-level decision processes concerning work, including decisions about the job design and discussing problems with higher-level managers. Participation in decision making increases the employee's feelings of belonging and commitment to the organization (Podsakoff, Mackenzie, Paine, & Bachrach, 2000). In addition, employees who have access to supervisors for discussing work-related problems are more likely to solve these problems, which decreases the likelihood of developing feelings of exhaustion and stress (De Rijk, Le Blanc, Schaufeli, & De Jonge, 1998).

Work settings in which employees have ample *opportunities for development* provide an important job resource because opportunities for growth increase employee motivation (Hackman & Oldham, 1976; Ryan & Deci, 2000). Employees are challenged when they can bring in ideas and learn new skills. Such a challenge results in more intrinsic motivation and increased vigor, absorption and dedication to the job (Bakker et al., 2007). Motivation and increased energy at work help employees cope successfully with heavy work demands, preventing feelings of burnout (Xanthopoulou et al., 2007).

A high quality relationship with one's supervisor (i.e., *supervisory coaching*) may alleviate the influence of job demands (i.e., work overload, emotional demands, and cognitive demands) on WHI because leaders' appreciation and support puts demands in another perspective and motivates employees (Van Yperen & Hagedoorn, 2003). Additionally, a supportive supervisor may help boost an employee's energy level by discussing family-related problems, reinforce the employee's positive self image, and reduce stress by showing understanding for the employee's family life (Halbesleben, 2006; Lapierre & Allen, 2006).

*Constructive feedback* not only helps employees do their work more effectively but also improves communication between supervisors and employees. When specific and accurate information is provided in a constructive way, both employees and supervisors can improve or change their performance (Martocchio & Webster, 1992). Appraising employees of good performance helps maintain their motivation and signals them to continue in this direction (Hackman & Oldham, 1980). Communicating with employees in a positive manner when they need to improve their performance will help prevent work problems and minimize surprises during the performance review. Additionally, performance feedback may mitigate the positive relationship between cognitive job demands and work-home interference because adequate feedback reduces the tendency to worry at home about work-related issues.

Our central hypothesis is that *all* these specific job resources may buffer the positive relationship between the three specific job demands and work-home interference. Stated formally, we hypothesize that job resources (autonomy, participation in decision



making, opportunities for development, quality of the relationship with the supervisor, and performance feedback) attenuate the positive relationship between job demands (work overload, emotional demands, and cognitive demands) and WHI.

## Method

### Procedure and participants

Medical residents registered through the Medical Registration Committee as being in training in The Netherlands on October 1, 2005, received a self-report questionnaire with a letter explaining the goal of the study at their home address. A cover letter explained that the purpose of the study was a survey on working conditions and emphasized anonymity. Of the 5245 medical residents approached, 105 indicated they were not eligible for the study because they were no longer in training. Of the 5140 eligible residents (the population), 2240 responded; 2115 (41.1%) completed the questionnaire, and 125 residents returned a non-response form indicating that they did not wish to participate. One-quarter of all questionnaires ( $N = 1310$ ) included a link to a survey for participants' partners, who were also invited to participate. In total, 242 partners responded (18.5%), of which 230 could be linked to individual doctors. In the present study, we wanted to link working conditions to partner ratings of WHI. We therefore conducted all analyses using the data from the 230 linked couples.

In terms of gender, 56.5% of the participating medical residents were female. The mean age of the doctors was 31.50 years ( $SD = 3.44$ ), and the mean age of the partners was 32.33 years ( $SD = 4.52$ ). A vast majority of the sample (93.0%) was married or lived with the partner, and 35.7% of the respondents had one or more children. The five most common specialties in the sample were internal medicine (14.8%), psychiatry (10.9%), surgery (8.7%), pediatrics (7.4%), and anesthesiology (6.5%).

### Measures

#### Job demands

*Work overload* (4 items;  $\alpha = .87$ ), *emotional demands* (6 items;  $\alpha = .75$ ), and *cognitive demands* (4 items;  $\alpha = .81$ ) were each assessed with shortened scales (e.g., Bakker, Demerouti, Taris, et al., 2003) of the Questionnaire on the Experience and Evaluation of Work (QEEW), which is widely used by applied researchers in The Netherlands (Van Veldhoven, De Jonge, Broersen, Kompier, & Meijman, 2002). Example items include "Do you have to work very fast?" (work overload); "At your work, are you confronted with people who complain continuously, although you do everything to help them?" (emotional demands), and "Does your work demand a lot of concentration?" (cognitive demands).

#### Job resources

Using scales developed by Bakker and his colleagues (Bakker, Demerouti, & Schaufeli, 2003, Bakker, Demerouti, Taris, et al., 2003, Bakker et al., 2004), five job resources were assessed: *job autonomy* (3 items;  $\alpha = .71$ ), *opportunity to learn and to develop* (3 items;  $\alpha = .77$ ), *performance feedback* (5 items;  $\alpha = .86$ ), *supervisory coaching* (6 items;  $\alpha = .87$ ), and *participation in decision making* (4 items;  $\alpha = .77$ ). Example items include "Do you have freedom in carrying out your work activities?" (autonomy); "Do you learn new things in your work?" (opportunities to learn and to develop); "Does your work provide you with direct feedback on how well you are doing your work?" (feedback); "My supervisor stimulates me to develop my talents" (coaching); and "I feel that I am involved in making important decisions" (participation in decision making). All demand and resource items were scored on a 5-point rating scale ranging from 1 ("never") to 5 ("always").

*Work-home interference* (WHI) was measured with three items from the Survey Work-home Interference Nijmegen (SWING; Geurts et al., 2005; see Demerouti et al., 2004). Partners of the participants were asked to indicate the extent to which their partner's medical resident work negatively influenced their home situation using the following three items: "How often does it happen that: 1) your partner finds it difficult to fulfill his/her domestic obligations because he/she is constantly thinking about his/her work?; 2) your partner does not fully enjoy your company because he/she worries about work?; and 3) your partner's work schedule makes it difficult for him/her to fulfill his/her domestic obligations?" (1 = never, 5 = always). The internal consistency of the scale was good (Cronbach's  $\alpha = .78$ ).

### Analysis

The hypotheses were tested using OLS regression with partner-rated WHI as the dependent variable. We calculated the centered cross products of the five job resource measures and the three job demands measures. The cross products were entered into the regression analyses, including the original job resource measures and job demand measures. This analysis strategy resulted in 15 interaction models.

## Results

### Descriptive statistics

Table 1 shows the means, standard deviations, and correlations of the study variables.

**Table 1**  
Means, standard deviations, and intercorrelations of the study variables,  $N = 230$ .

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
1. Workload	3.30	.79								
2. Emotional demands	2.41	.51	.36**							
3. Cognitive demands	3.98	.59	.37**	.35**						
4. Job autonomy	3.05	.68	-.09	-.14*	-.07					
5. Opportunities for development	3.77	.58	-.13	-.23**	-.02	.35**				
6. Performance feedback	3.12	.77	-.32**	-.31**	-.07	.19**	.40**			
7. Supervisory coaching	2.91	.73	-.24**	-.16*	-.04	.40**	.45**	.64**		
8. Participation in decision making	3.15	.72	-.22**	-.27**	-.15*	.49**	.42**	.39**	.48**	
9. Work-home interference	2.48	.77***	.24**	.24**	.19**	-.16*	-.17*	-.20**	-.19**	-.20**

\*\*\*  $p < .001$ .  
\*\*  $p < .01$ .  
\*  $p < .05$ .

*Test of the Job Demands × Resources Interaction Hypothesis*

Our central hypothesis stated that job demands would be positively related to partner ratings of WHI when job resources are low. The analysis results are shown in Tables 2–4. Job demands were consistently and positively related to WHI, whereas job resources were negatively associated with WHI. Our hypothesis was supported for 8 of the 15 (53%) possible two-way interaction effects. Unexpectedly, *job autonomy* did not moderate the relationships between any of the job demands and WHI. *Participation in decision making* was a significant moderator of the positive relationship between all three job demands and WHI. *Opportunities for development* significantly attenuated the relationship between workload, but not cognitive demands and emotional demands, and WHI. The interactions terms between *performance feedback* and two of the job demands (workload and emotional demands) were significant. Finally, *supervisory coaching* significantly attenuated the positive effect of workload and cognitive demands on the one hand and WHI on the other hand. For illustrative purposes, Figs. 1–3 show a graphical display of three different interaction effects. The plotted interactions are chosen in a way that they represent each of the three job demands in combination with three different job resources.

**Table 2**  
Regression of partner-rating of work-home interference on workload and job resources,  $N = 230$ .

Variable	Model 1			Model 2		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
Workload	.18	.05	.23***	.18	.05	.23***
Job autonomy	-.11	.05	-.14*	-.10	.05	-.14*
Workload × Job autonomy				-.09	.05	-.11†
<i>R</i> <sup>2</sup>		.079			.013	
<i>F</i> for change in <i>R</i> <sup>2</sup>		9.79***			3.17†	
Workload	.17	.05	.23***	.15	.05	.19**
Opportunities for development	-.11	.05	-.14*	-.13	.05	-.18**
Workload × Opportunities for development				-.13	.05	-.18**
<i>R</i> <sup>2</sup>		.079			.029	
<i>F</i> for change in <i>R</i> <sup>2</sup>		9.76***			7.47**	
Workload	.15	.05	.20**	.15	.05	.19**
Performance feedback	-.11	.05	-.14*	-.11	.05	-.15*
Workload × Performance feedback				-.10	.05	-.13*
<i>R</i> <sup>2</sup>		.077			.016	
<i>F</i> for change in <i>R</i> <sup>2</sup>		9.41***			3.97*	
Workload	.16	.05	.21***	.14	.05	.19**
Supervisory coaching	-.10	.05	-.13*	-.11	.05	-.15*
Workload × Supervisory coaching				-.12	.05	-.15*
<i>R</i> <sup>2</sup>		.077			.021	
<i>F</i> for change in <i>R</i> <sup>2</sup>		9.41***			5.31*	
Workload	.16	.05	.21***	.17	.05	.22***
Participation in decision making	-.11	.05	-.15*	-.10	.05	-.13*
Workload × Participation in decision making				-.13	.05	-.17**
<i>R</i> <sup>2</sup>		.081			.027	
<i>F</i> for change in <i>R</i> <sup>2</sup>		9.98***			6.86**	

Note. All variables were centered at their means.  
\*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , †  $p < .10$ .

**Table 3**  
Regression of partner-rating of work–home interference on emotional demands and job resources,  $N = 230$ .

Variable	Model 1			Model 2		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
Emotional demands	.17	.05	.23***	.16	.05	.21***
Job autonomy	−.10	.05	−.13*	−.09	.05	−.11†
Emotional demands × Job autonomy				−.08	.05	−.12†
$R^2$		.076			.013	
<i>F</i> for change in $R^2$		9.28***			3.20†	
Emotional demands	.17	.05	.22***	.16	.05	.21**
Opportunities for development	−.09	.05	−.12†	−.09	.05	−.12†
Emotional demands × Opp. for development				−.04	.05	−.06
$R^2$		.073			.003	
<i>F</i> for change in $R^2$		8.90***			.78	
Emotional demands	.15	.05	.20**	.14	.05	.18**
Performance feedback	−.11	.05	−.14*	−.10	.05	−.13†
Emotional demands × Performance feedback				−.13	.05	−.16*
$R^2$		.076			.026	
<i>F</i> for change in $R^2$		9.37***			6.45*	
Emotional demands	.17	.05	.22***	.17	.05	.22***
Supervisory coaching	−.11	.05	−.15*	−.11	.05	−.14*
Emotional demands × Supervisory coaching				−.07	.05	−.08
$R^2$		.081			.007	
<i>F</i> for change in $R^2$		9.99***			1.73	
Emotional demands	.16	.05	.21**	.14	.05	.18**
Participation in decision making	−.11	.05	−.14*	−.09	.05	−.11†
Emotional demands × Participation				−.10	.05	−.15**
$R^2$		.078			.020	
<i>F</i> for change in $R^2$		9.56***			5.13*	

Note. All variables were centered at their means.  
\*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , †  $p < .10$ .

**Table 4**  
Regression of partner-rating of work–home interference on cognitive demands and job resources,  $N = 230$ .

Variable	Model 1			Model 2		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
Cognitive demands	.14	.05	.18**	.13	.05	.17**
Job autonomy	−.11	.05	−.15*	−.10	.05	−.13*
Emotional demands × Job autonomy				−.09	.05	−.11†
$R^2$		.057			.012	
<i>F</i> for change in $R^2$		6.80***			3.03†	
Cognitive demands	.14	.05	.18**	.13	.05	.17**
Opportunities for development	−.13	.05	−.17*	−.13	.05	−.17**
Cognitive demands × Opp. for development				−.07	.05	−.10
$R^2$		.062			.010	
<i>F</i> for change in $R^2$		7.52***			2.48	
Cognitive demands	.13	.05	.17**	.15	.05	.19**
Performance feedback	−.14	.05	−.19**	−.14	.05	−.18**
Cognitive demands × Performance feedback				−.06	.05	−.08
$R^2$		.070			.007	
<i>F</i> for change in $R^2$		8.53***			1.64	
Cognitive demands	.14	.05	.18**	.14	.05	.18**
Supervisory coaching	−.14	.05	−.18**	−.13	.05	−.17**
Cognitive demands × Supervisory coaching				−.11	.06	−.13*
$R^2$		.066			.017	
<i>F</i> for change in $R^2$		8.03***			4.27*	
Cognitive demands	.12	.05	.16*	.13	.05	.16*
Participation in decision making	−.13	.05	−.17**	−.10	.05	−.13*
Cognitive demands × Participation				−.12	.05	−.16*
$R^2$		.064			.022	
<i>F</i> for change in $R^2$		7.74***			5.56*	

Note. All variables were centered at their means.  
\*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , †  $p < .10$ .

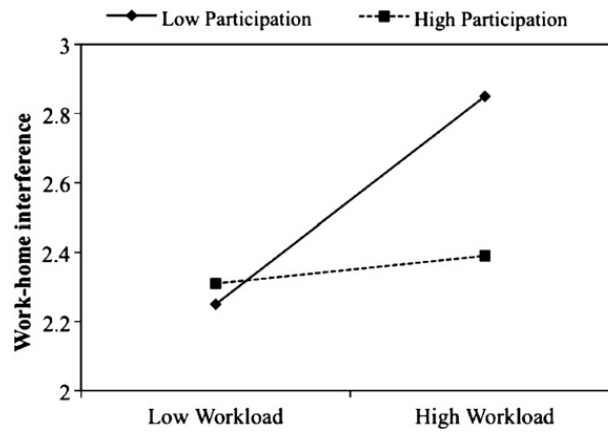


Fig. 1. Interaction effect of workload and participation in decision making on partner-ratings of work-home interference.

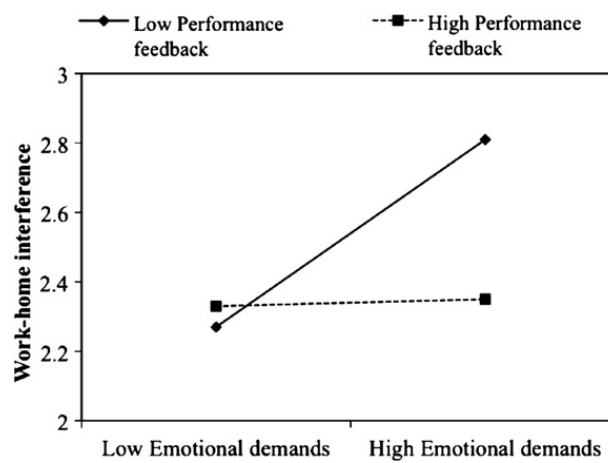


Fig. 2. Interaction effect of emotional demands and performance feedback on partner-ratings of work-home interference.

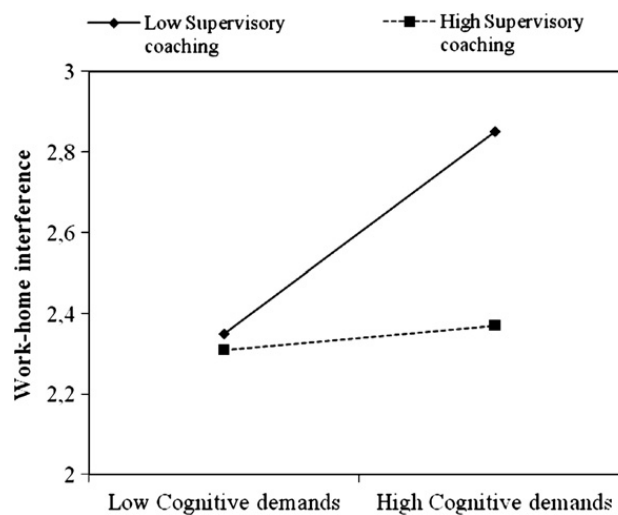


Fig. 3. Interaction effect of cognitive demands and supervisory coaching on partner-ratings of work-home interference.

## Discussion

We aimed to gain more insight regarding the specific combinations of job characteristics that lead to work-home interference. For this purpose, we used the JD-R model as a theoretical framework. Although some caution is needed, our study supports our central hypothesis that a combination of high job demands and low job resources results in most WHI. A majority of the interaction



effects between the three types of job demands (quantitative, emotional, and cognitive demands) and the five job resources (job autonomy, feedback, supervisory coaching, opportunities for development, and participation in decision making) examined in this study significantly predicted WHI. A closer look at our findings revealed that work overload is an important predictor of WHI, as has been suggested by previous studies (e.g., Grzywacz & Marks, 2000). However, our results add that work overload does not necessarily result in WHI when employees have sufficient job resources. Except for job autonomy, all of the job resources attenuated the harmful effect of work overload on WHI. Similarly, emotional job demands only marginally increased WHI when employees received performance feedback and participated in decision making at work. Finally, cognitive job demands particularly increased WHI when combined with low supervisory coaching and participation in decision making.

These results support the idea that the combination of specific job demands and job resources should be taken into account to gain a clear picture of which particular job designs facilitate work–family interference. Simultaneously, our results provide an explanation for the mixed results produced by previous research on the effects of job demands and job resources on WHI (e.g., Parasuraman & Simmers, 2001). The main effects of job demands and job resources on WHI can differ when interaction effects are not taken into account. In sum, job designs in which employees are burdened with a lot of work and have emotionally and cognitively demanding tasks, but lack supervisor support, opportunities for development, and participation in decision making, are particularly likely to increase WHI in the employee.

Remarkably, job autonomy, which is regarded as an important moderator of the demands–strain relationship by the demands–control model, did not significantly moderate the positive relationships between job demands and WHI (De Jonge & Dormann, 2006; Karasek, 1979; Van Yperen & Hagedoorn, 2003). Previous studies have also reported mixed findings regarding the demands–control interaction effect (Bakker et al., 2007; Butler et al., 2005; Van der Doef & Maes, 1999). Furthermore, others have reported that a restriction in job autonomy (e.g., bureaucratic rigidity and limited schedule flexibility) reduces work-to-family conflict in service workers because such regulations enable employees to set clear work–life boundaries (Blair-Loy, 2009; Desrochers, Hilton, & Larwood, 2005). Although the interaction terms in our study, including job autonomy, were only marginally non-significant ( $p < .10$ ), our findings suggest that other job resources, such as performance feedback and supervisory coaching, are at least as important as job autonomy. This is particularly understandable in the context of this study because medical residents follow a training program whereby they are consecutively employed in different departments. Medical residents particularly benefit from emotional support and feedback about their learning process (Prins et al., 2007), whereas having a say in how the work is done is less important and less relevant to them. In the healthcare system, work processes are often guided by protocols. It is very likely that employees can only influence work processes during the development of those protocols, but not once those protocols have been established. This is also reflected by our results because participation in decision making, which allows medical residents to influence their work design, was the most important buffer reducing the positive effect of all three job demands on WHI. In line with the assumptions of the JD–R model, our study shows that many different types of job resources can buffer the undesirable influence of job demands.

The results of the present study also challenge the idea that job resources only buffer the undesirable effect of job demands when the type of job resources and job demands match (De Jonge & Dormann, 2006; Frese, 1999). According to the *matching hypothesis*, emotional resources only help reduce the undesirable effects of emotional job demands, whereas physical and cognitive resources are beneficial for preventing stress due to physical workload and cognitive demands, respectively. Our findings do not reveal such a consistent interaction pattern between job demands and job resources. For example, emotional support (supervisory coaching) was equally effective in reducing WHI due to work overload and cognitive demands. Similarly, participation in decision making, a cognitive resource according to De Jonge and Dormann (2006), reduced WHI that was a function of all three job demands. We suggest that it is difficult to divide job resources into clearly distinguishable categories. It is possible that an employee uses participation in decision making to optimize his or her work processes, whereby this resource could be labeled as cognitive. However, it is equally possible that employees feel appreciated by the organization when they are involved in decision making, which would make this resource emotional. Apparently, whether job resources match with job demands is not very relevant. Instead, we speculate that the work context plays an important role in explaining which resources are particularly helpful for dealing with job demands. In the occupational context of medical residents, adequate feedback and support as well as having a voice in discussions about how the work should be done seem more important than actual decision latitude and independence in performing work tasks.

### Limitations

The results of this study must be viewed in light of some limitations. First, the study was cross-sectional, meaning that no firm conclusions regarding the causality of relationships can be drawn. However, several previous studies have shown that the job demands and resources included in the present study are predictors of strain rather than outcomes (Halbesleben & Buckley, 2004). A second limitation is that we investigated a specific group of employees, namely medical residents and their partners. Although previous studies among other professions (e.g., teachers and dentists) have produced comparable interaction effects of demands and resources on job burnout and engagement (Bakker et al., 2005; Hakanen et al., 2005), more research is needed to confirm the generalizability of our findings. It is possible that the relevant job demands and job resources vary with occupation. Third, our measurement of WHI was not optimal, as it included a mixture of items on strain-based and time-based work–home interference. Although time-based and strain-based work–home interference are both strong indicators of the latent construct work–home conflict (Van Steenbergen, Ellemers, & Mooijaart, 2007), future studies may distinguish between both dimensions. Finally, the interaction terms explained only a limited amount of the variance in WHI. Caution may thus be warranted in interpreting the

practical implications of the present study. It should be noted, however, that effect sizes for interactions are usually small ( $R^2 \leq .02$ ), especially in non-experimental studies (Frazier, Tix, & Barron, 2004; Siemsen, Roth, & Oliveira, 2010). Therefore we believe that the interactions are important, at least from a theoretical perspective, because they shed light on the combination of different working conditions that may foster WHI. Despite these limitations, a clear strength of the current study is the use of partner ratings of WHI, which resolves issues associated with common method variance.

#### Future directions

Our results provide several directions for future research. One next step could be to examine the effects of job design on positive outcomes, such as work-home facilitation (WHF). Researchers increasingly point to the possible beneficial relationships between the work and home domains (Voydanoff, 2004). The role of individual differences could also be examined more thoroughly. For example, persons high in self-efficacy and low in neuroticism may use job resources more effectively (Grzywacz & Marks, 2000). Consequently, the buffering potential of job resources for the relationship between job demands and WHI may be stronger when self-efficacy is high and neuroticism is low. Additionally, more research is needed to explicitly test the theoretical mechanisms explaining why job demands and job resources increase or decrease WHI. Future studies could investigate whether loss or gain of personal resources (e.g., time deficit and more self-esteem) mediates the effects of job characteristics on WHI. It may also be interesting to include more concrete family outcomes (e.g., relationship quality and family satisfaction) as possible outcomes when testing the buffer hypothesis of the JD-R model. Finally, future studies should investigate whether our results can be generalized to various work settings other than medical residents.

#### Practical implications

This study provides useful insights for managerial practice. The results indicate that participation in decision making particularly buffers the harmful effect of job demands on WHI. It seems that employees are better able to cope with high job demands when they feel they have a say in how their work is organized. Furthermore, supervisors seem to play an important role in impacting how high job demands influence WHI. Supervisors could support employees by providing adequate feedback and coaching. Finally, because every occupation may have its specific work demands and work resources, we advise managers to scrutinize which demands and resources are particularly salient to their occupation. We have developed an Internet application of the JD-R model in which employees who fill in an electronic questionnaire receive online feedback about the most important demands and resources of their job. In this way, employees receive tailor-made feedback about their work demands (e.g., overload) and about the availability of job resources (e.g., supervisor feedback). This information is consequently used as input for a personal development plan. Sharing perspectives between employees and managers about ways to diminish demands and extend resources may be an alternative starting point for job (re)design. Employees and managers should then discuss the possibilities for adjusting the work environment to the needs and abilities of individual employees (Ten Brummelhuis & van der Lippe, 2010). In this way, the fit between person and organization is optimized, preventing work-home interference and other undesirable consequences, such as burnout and personnel turnover.

#### Conclusion

Overall, our study has shown that the JD-R model provides a fruitful framework for explaining which particular job designs facilitate, or instead prevent, work-home interference. Whereas job demands may increase WHI, such harmful effects are less pronounced in job contexts with abundant resources. Similarly, resources may directly diminish WHI, but such resources are less helpful when employees face heavy work demands. The findings thus emphasize the importance of taking into account the specific combination of demands and resources that are characteristic of a job when considering work-home interference.

#### Acknowledgments

This study was supported by unrestricted grants of SWG Arts en Werk, Stichting Capaciteitsorgaan, Dutch Association of Medical Residents (LVAG), and the University Medical Center Groningen, The Netherlands.

#### References

- Allen, T. D., Herst, D. E., Bruck, C. S., & Sutton, M. (2000). Consequences associated with work-to-family conflict: A review and agenda for future research. *Journal of Occupational Health Psychology, 5*, 278–308.
- Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology, 22*, 309–328.
- Bakker, A. B., & Demerouti, E. (2008). Toward a model of work engagement. *Career Development International, 13*, 209–223.
- Bakker, A. B., Demerouti, E., & Euwema, M. C. (2005). Job resources buffer the impact of job demands on burnout. *Journal of Occupational Health Psychology, 10*, 170–180.
- Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2003). Dual processes at work in a call centre: An application of the job demands-resources model. *European Journal of Work and Organizational Psychology, 12*, 393–417.
- Bakker, A. B., Demerouti, E., Taris, T., Schaufeli, W. B., & Schreurs, P. (2003). A multi-group analysis of the Job Demands-Resources model in four home care organizations. *International Journal of Stress Management, 10*, 16–38.

- Bakker, A. B., Demerouti, E., & Verbeke, W. (2004). Using the job demands–resources model to predict burnout and performance. *Human Resource Management*, 43, 83–104.
- Bakker, A. B., & Geurts, S. A. E. (2004). Toward a dual-process model of work–home interference. *Work & Occupations*, 31, 345–366.
- Bakker, A. B., Hakanen, J. J., Demerouti, E., & Xanthopoulou, D. (2007). Job resources boost work engagement, particularly when job demands are high. *Journal of Educational Psychology*, 99, 274–284.
- Bakker, A. B., Van Veldhoven, M. J. P. M., & Xanthopoulou, D. (2010). Beyond the Demand–Control model: Thriving on high job demands and resources. *Journal of Personnel Psychology*, 9, 3–16.
- Blair-Loy, M. (2009). Work without end? Scheduling flexibility and work-to-family conflict among stockbrokers. *Work & Occupations*, 36, 279–317.
- Brough, P., & O'Driscoll, M. P. (2010). Organisational interventions for balancing work and home demands: An overview. *Work & Stress*, 24, 280–297.
- Byron, K. (2005). A meta-analytic review of work–family conflict and its antecedents. *Journal of Vocational Behavior*, 67, 169–198.
- Butler, A. B., Grzywacz, J. G., Bass, B. L., & Linney, K. D. (2005). Extending the demands-control model: A daily diary study of job characteristics, work–family conflict and work–family facilitation. *Journal of Occupational and Organizational Psychology*, 78, 155–169.
- De Jonge, J., & Dormann, C. (2006). Stressors, resources, and strain at work: A longitudinal test of the triple-match principle. *Journal of Applied Psychology*, 91, 1359–1374.
- Demerouti, E., Bakker, A. B., & Bulters, A. J. (2004). The loss spiral of work pressure, work–home interference and exhaustion: Reciprocal relations in a three-wave study. *Journal of Vocational Behavior*, 64, 131–149.
- Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The Job Demands–Resources model of burnout. *Journal of Applied Psychology*, 86, 499–512.
- De Rijk, A. E., Le Blanc, P. M., Schaufeli, W. B., & De Jonge, J. (1998). Active coping and need for control as moderators of the job demand-control model: Effects on burnout. *Journal of Occupational and Organizational Psychology*, 71, 1–18.
- Desrochers, S., Hilton, J., & Larwood, L. (2005). Preliminary validation of the work–family integration-blurring scale. *Journal of Family Issues*, 26, 442–466.
- Diener, E., & Fujita, F. (1995). Resources, personal strivings, and subjective well-being: A nomothetic and idiographic approach. *Journal of Personality and Social Psychology*, 68, 926–935.
- Eby, L. T., Casper, W. J., Lockwood, A., Bordeaux, C., & Brinley, A. (2005). Work and family research in IO/OB: Content analysis and review of the literature (1980–2002). *Journal of Vocational Behavior*, 66, 124–197.
- Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology*, 51, 115–134.
- Frese, M. (1999). Social support as a moderator of the relationship between work stressors and psychological dysfunctioning: A longitudinal study with objective measures. *Journal of Occupational Health Psychology*, 4, 179–192.
- Frone, M. R., Russell, M., & Cooper, M. L. (1992). Antecedents and outcomes of work–family conflict: Testing a model of the work–family interface. *Journal of Applied Psychology*, 77, 65–78.
- Gajendran, R. S., & Harrison, D. A. (2007). The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences. *Journal of Applied Psychology*, 92, 1524–1541.
- Galinsky, E., Bond, J. T., & Friedman, D. E. (1993). *The changing workforce: Highlights of the national study*. New York: Families and Work Institute.
- Geurts, S. A. E., Taris, T. W., Kompier, M. A. J., Dijkers, J. S. E., van Hooff, M. L. M., & Kinnunen, U. (2005). Work–home interaction from a work psychological perspective: Development and validation of a new questionnaire, the SWING. *Work and Stress*, 19(4), 319–339.
- Glass, J. L., & Finley, A. (2002). Coverage and effectiveness of family-responsive workplace policies. *Human Resource Management Review*, 12, 313–337.
- Greenhaus, J. H., & Beutell, N. J. (1985). Sources of conflict between work and family roles. *Academy of Management Review*, 10, 76–88.
- Grandey, A., & Cropanzano, R. (1999). The conservation of resources model applied to work–family conflict and strain. *Journal of Vocational Behavior*, 54, 350–370.
- Grzywacz, J. G., & Marks, N. F. (2000). Re-conceptualizing the work–family interface: An ecological perspective on the correlates of positive and negative spillover between work and family. *Journal of Occupational Health Psychology*, 5, 111–126.
- Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, 16, 250–279.
- Hackman, J. R., & Oldham, G. R. (1980). *Work redesign*. MA: Addison-Wesley, Reading.
- Hakanen, J. J., Bakker, A. B., & Demerouti, E. (2005). How dentists cope with their job demands and stay engaged: The moderating role of job resources. *European Journal of Oral Sciences*, 113, 479–487.
- Halbesleben, J. R. B. (2006). Sources of social support and burnout: A meta-analytic test of the conservation of resources model. *Journal of Applied Psychology*, 91, 1134–1145.
- Halbesleben, J. R. B., & Buckley, M. R. (2004). Burnout in organizational life. *Journal of Management*, 30, 859–879.
- Heponiemi, T., Elovainio, M., Pekkarinen, L., & Sinervo, T. (2008). The effects of job demands and low job control on work–family conflict: The role of fairness in decision making and management. *Journal of Community Psychology*, 36, 387–2008.
- Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology*, 6, 307–324.
- Janssen, P. P. M., Peeters, M. C. W., De Jonge, J., Houkes, I., & Tummers, G. E. R. (2004). Specific relationships between job demands, job resources and psychological outcomes and the mediating role of negative work–home interference. *Journal of Vocational Behavior*, 65, 411–429.
- Jenkins, R. (1991). Demographic aspects of stress. In C. L. Cooper, & R. Payne (Eds.), *Personality and stress: Individual differences in the stress process* (pp. 107–132). New York: Wiley.
- Kahn, R. L., Wolfe, D. M., Quinn, R. P., Snoek, J. D., & Rosenthal, R. A. (1964). *Organizational stress: Studies in role conflict and ambiguity*. New York: John Wiley.
- Karasek, R. A. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. *Administrative Science Quarterly*, 24, 285–308.
- Karasek, R. (1998). Demand/control model: A social, emotional, and psychosocial approach to stress risk and active behaviour development. In J. M. Stellman (Ed.), *Encyclopaedia of occupational health and safety* (pp. 34.6–34.14). Geneva: International Labour Organization.
- Lapierre, L. M., & Allen, T. D. (2006). Work-supportive family, family-supportive supervision, use of organizational benefits, and problem-focused coping: Implications for work–family conflict and employee well-being. *Journal of Occupational Health Psychology*, 11, 169–181.
- Martocchio, J. J., & Webster, J. (1992). Effects of feedback and cognitive playfulness on performance in microcomputer software training. *Personnel Psychology*, 45, 553–578.
- Parasuraman, S., & Simmers, C. A. (2001). Type of employment, work–family conflict and well-being: A comparative study. *Journal of Organizational Behavior*, 22, 551–568.
- Podsakoff, P. M., Mackenzie, S. B., Paine, J. B., & Bachrach, D. G. (2000). Organizational citizenship behaviors: A critical review of the theoretical and empirical literature and suggestions for future research. *Journal of Management*, 26, 513–563.
- Prins, J. T., Hoekstra-Weebers, J. E. H. M., Gazendam-Donofrio, S. M., van de Wiel, H. B. M., Sprangers, F., Jaspers, F. C. A., et al. (2007). The role of social support in burn-out among Dutch medical residents. *Psychology, Health & Medicine*, 12, 1–6.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. *The American Psychologist*, 55, 68–78.
- SCP (2008). *Emancipatiemonitor [National statistics of the Dutch labor force]*. Texera: The Hague.
- Siemsen, E., Roth, A., & Oliveira, P. (2010). Common method bias in regression models with linear, quadratic, and interaction effects. *Organizational Research Methods*, 13, 456–476.
- Ten Brummelhuis, L. L., & van der Lippe, T. (2010). Effective work–life balance support for various household structures. *Human Resource Management*, 49, 175–195.
- Van Daalen, G., Willemsen, T. M., & Sanders, K. (2006). Reducing work–family conflict through different sources of social support. *Journal of Vocational Behavior*, 69, 462–476.
- Van der Doef, M., & Maes, S. (1999). The job demand–control (–support) model and psychological well-being: A review of 20 years of empirical research. *Work & Stress*, 13, 87–114.

- Van Steenbergen, E. F., Ellemers, N., & Mooijaart, A. (2007). How work and family can facilitate each other: Distinct types of work–family facilitation outcomes for women and men. *Journal of Occupational Health Psychology, 12*, 279–300.
- Van Veldhoven, M., De Jonge, J., Broersen, S., Kompier, M., & Meijman, T. (2002). Specific relationships between psychosocial job conditions and job-related stress: A three-level analytic approach. *Work & Stress, 16*, 207–228.
- Van Yperen, N. W., & Hagedoorn, M. (2003). Do high job demands increase intrinsic motivation or fatigue or both? The role of job control and job social support. *Academy of Management Journal, 46*, 339–348.
- Voydanoff, P. (2004). The effects of work demands and resources on work-to-family conflict and facilitation. *Journal of Marriage and Family, 66*, 398–412.
- Voydanoff, P. (2005). Toward a conceptualization of perceived work–family fit and balance: A demands and resources approach. *Journal of Marriage and Family, 67*, 822–836.
- Xanthopoulou, D., Bakker, A. B., Dollard, M. F., Demerouti, E., Schaufeli, W. B., Taris, T. W., et al. (2007). When do job demands particularly predict burnout? *Journal of Managerial Psychology, 22*, 766–786.