International Journal of Nursing Studies 148 (2023) 104567

Contents lists available at ScienceDirect

International Journal of Nursing Studies

journal homepage: www.elsevier.com/locate/ns

What makes nurses flourish at work? How the perceived clinical work environment relates to nurse motivation and well-being: A cross-sectional study

Dorothea Kohnen [a,d,*], Hans De Witte [a,b], Wilmar B. Schaufeli [a,c], Simon Dello [d], Luk Bruyneel [d], Walter Sermeus [d]

[a] Research Group Work, Organizational, and Personnel Psychology, KU Leuven, Leuven, Belgium
[b] Optentia Research Unit, North-West University, South Africa
[c] Department of Psychology, Utrecht University, Utrecht, the Netherlands
[d] KU Leuven Institute for Healthcare Policy, KU Leuven, Leuven, Belgium

ARTICLE INFO

Article history:
Received 22 December 2022
Received in revised form 14 June 2023
Accepted 17 July 2023
Available online xxxx

Keywords:
Work motivation
Well-being
Burnout
Nurses
Work environment
Structural equation modeling

ABSTRACT

Background: Literature shows that the work environment is a main determinant of nurses' well-being and psychological strain; yet, the (psychological) mechanisms underlying this relationship remain understudied.
Objective: This study explored the underlying (psychological) mechanisms (why) and boundary conditions (when) by which characteristics present in the clinical work environment influence nurses' well-being. We investigated the mediating role of intrinsic motivation in the relationship of job demands and job resources with burnout vs. work engagement. In addition, we examined if job resources strengthen the relationship of job demands with intrinsic motivation and burnout.
Design: A cross-sectional survey study.
Setting(s): General acute care hospitals in Belgium (n = 14).
Participants: Direct care nurses (n = 1729).
Methods: Data were collected by means of online questionnaires between October 2020 and July 2021. Study variables included burnout, work engagement, intrinsic motivation and a set of different job demands (workload, role conflicts, emotional demands, red tape) and job resources (performance feedback, autonomy, skill use, opportunity for growth, and value congruence). All variables were obtained using self-report measures. The central hypotheses were tested using structural equation modeling.
Results: Job resources appeared to be a crucial factor for nurses' health showing positive associations with work motivation ($\beta = 0.513$) and work engagement ($\beta = 0.462$) and negative associations with burnout ($\beta = -0.216$). Job demands remained an essential factor that harms psychological health and is associated with increased burnout ($\beta = 0.489$). Our results confirmed that intrinsic motivation mediated the relationship of job resources with work engagement ($\beta = 0.170$) and burnout ($\beta = -0.135$). In addition, job resources moderated the relationship of job demands with burnout ($\beta = -0.039$). Against our expectations, we found no associations between job demands and intrinsic motivation or a moderation effect of job resources on the respective relationship.
Conclusions: A highly demanding work environment can be a source of significant stress which may put nurses' health at severe risk. Nurses who perceive sufficient job resources such as feedback, autonomy and opportunities for growth and development, are likely to feel intrinsically motivated at work. In addition, it will foster their work engagement and prevent them from burning out, particularly when job demands are high.
Registration: The study described herein is funded under the European Union's Horizon 2020 Research and Innovation program from 2020 to 2023 (Grant Agreement 848031). The protocol of Magnet4Europe is registered in the ISRCTN registry (ISRCTN10196901).
Tweetable abstract: Providing nurses with sufficient resources will not only increase their motivation and engagement at work but also reduce their feelings of burnout.

* Corresponding author at: Faculty of Psychology & Educational Sciences, KU Leuven, Van den Heuvelinstituut (VHI), Dekenstraat 2, 3000 Leuven, Belgium.
E-mail address: dorothea.kohnen@kuleuven.be (D. Kohnen)
Social media: @DoroKohnen, @WilmarSchaufeli, @Magnet4Europe.

https://doi.org/10.1016/j.ijnurstu.2023.104567
0020-7489/

What is already known

- For healthcare organizations employees' work motivation is considered a key element in order to provide high-quality care and to meet constantly changing demands.
- Theory and evidence on the Job Demands-Resource model show that job resources are key drivers for work engagement, while excessive job demands combined with a lack of job resources are associated with higher levels of job strain and burnout.

What this paper adds

- While intrinsic motivation was meaningfully associated with job resources, work engagement, and burnout, it showed no significant relationship with job demands.
- Nurses who perceive sufficient job resources such as feedback, autonomy and opportunities for growth and development, are likely to feel intrinsically motivated at work which in turn will foster their work engagement and second, prevent them from burning out, particularly when job demands are high.
- Job demands remain an essential factor for nurses' burnout, particularly when job resources are low.

1. Introduction

The clinical environment, whether demanding or resourceful, acts on nurses' energy as it influences their psychological functioning, which in turn, relates to their motivation and behavior (Van den Broeck et al., 2008). The Job Demands-Resources (JD-R) model (Demerouti et al., 2001; Schaufeli and Bakker, 2004) is the most widely used job stress model to explain occupational stress and how it relates to employee health. In essence, this model proposes two psychological processes by which excessive job demands lead – via burnout – to negative outcomes (*health impairment process*) whereas job resources – via work engagement – will foster positive outcomes (*motivational process*) and reduce burnout (Schaufeli and Taris, 2014). Job demands are those "aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs" (Demerouti et al., 2001, p. 501). Job resources, in turn, are defined as "those physical, psychological, social, or organizational aspects of the job that are either/or (1) functional in achieving work goals, (2) reduce job demands and the associated physiological and psychological costs, (3) stimulate personal growth, learning, and development" (Demerouti et al., 2001, p. 501).

In line with this view, the JD-R model has been tested and validated across a variety of samples from different countries and industries (Hu et al., 2011; Llorens et al., 2007), including healthcare (Jourdain and Chênevert, 2010; Keyko et al., 2016; Kutney-Lee et al., 2013; Lee and Akhtar, 2011; Stimpfel et al., 2012). Among nursing staff, in particular, job demands such as work overload and emotional demands were found to predict burnout (Montgomery et al., 2015; Sundin et al., 2011). By contrast, job resources such as job autonomy or performance feedback have been found to be positively related to work engagement (Humphrey et al., 2007; Keyko et al., 2016; Lesener et al., 2019) and to be negatively associated with burnout (Hakanen et al., 2006). Burnout – in this study – is defined as a work-related state of mental exhaustion, which is characterized by extreme tiredness, reduced ability to regulate cognitive and emotional processes, and mental distancing (Schaufeli et al., 2020). Work engagement, on the other hand, refers to a positive, fulfilling, work-related state of mind that is characterized by vigor (that is, high level of energy and mental resilience while working), dedication (referring to a sense of significance, enthusiasm, and challenge), and absorption (being focused and happily engrossed in one's work) (Schaufeli et al., 2002; Schaufeli and Bakker, 2004). By including burnout and work engagement, this study simultaneously focuses on both the negative aspect (burnout) and positive aspect (work engagement) of job-related well-being.

It has been argued that personal resources have a crucial role in the association between employees and their reaction to job demands and resources (Sonnentag and Frese, 2012). Personal resources are defined as the aspects of the self that are associated with resilience and that refer to the ability to control and impact one's environment successfully (Hobfoll et al., 2003). In the present study we posit that intrinsic motivation functions as a personal resource as it is believed to influence the way in which employees allocate and balance their resources (Kanfer et al., 2017). In order to get a better understanding of why work motivation acts on nurses' functioning and the role it plays in both the motivational and health impairment processes of the JD-R model (Demerouti et al., 2001; Schaufeli and Bakker, 2004), we rely on Self-Determination Theory (SDT, Ryan and Deci, 2000a, 2000b). While JD-R theory exemplifies what kind of job characteristics lead to certain psychological outcomes (i.e. burnout and work engagement), it does not tell us why this would be so (Schaufeli and Taris, 2014). An important feature of SDT is that it describes why people do what they do at work. To our knowledge, there has been no research empirically testing the impact of work motivation on the relationship between nurses' job characteristics and their well-being. Combining JD-R theory and SDT, the main purpose of this study is to deepen our understanding of the (underlying psychological) mechanisms (i.e. why) and boundary conditions (i.e. when) by which characteristics present in the clinical environment influence nurses' well-being.

1.1. Nurse motivation and how it relates to their well-being

According to SDT, the social (or work) environment can facilitate or undermine employees' motivation and functioning. It further posits that employees perform and feel better when their motivation is intrinsic, as part of autonomous motivation. Rather than working for a financial reward, intrinsically motivated employees perform a task because it is inherently interesting and challenging to them (Ryan and Deci, 2000a, 2000b). In nursing, the work is often perceived as meaningful, engaging, and rewarding, which is expected to generate positive job outcomes (Toode et al., 2015, 2011). Nurses who find themselves in a supportive work environment and can draw upon sufficient job resources, e.g. autonomy, performance feedback, and opportunities for growth and development, will feel intrinsically motivated. On the other hand, a demanding work environment in which nurses experience excessive stressors such as high workloads and role conflicts might frustrate nurses' fundamental psychological needs (like the need for autonomy and competence), reducing their work motivation. Therefore, it is expected that job resources will boost nurses' intrinsic motivation, whereas job demands are assumed to undermine it. In line with this reasoning, job resources such as decision authority (Tummers et al., 2002), autonomy as well as opportunities to learn (Janssen et al., 1999) were empirically found to be related to higher levels of nurses' motivation (Toode et al., 2015, 2011). With regard to job demands, several demotivating factors were reported such as poor supervision, lack of recognition and role stressors (i.e. role conflicts) (Daneshkohan et al., 2015; Kim and Beehr, 2018). The findings of studies that investigated the links between job demands and intrinsic motivation are, however, less consistent (Fernet et al., 2012). While some studies report negative associations (Fernet et al., 2012, 2004), others found no significant relationship between job demands and intrinsic motivation (Fernet et al., 2015; Van Yperen and Hagedoorn, 2003). A few studies even found high levels of workload to be related to high levels of intrinsic motivation (Beckers et al., 2004; Houkes et al., 2001; Tummers et al., 2002).

In relation to outcomes, work motivation among health professionals has been found to be closely related to work engagement,

burnout, job satisfaction, intent to leave, work performance, and perceived patient safety (for an overview Toode et al., 2011). In particular, research has shown that intrinsic motivation was negatively related to burnout and positively related to work engagement (Fernet et al., 2015; Van Beek et al., 2012), indicating that motivation was associated with higher levels of vitality, absorption, concentration, effort, and persistence. Similar results were reported by a recent meta-analysis (Van den Broeck et al., 2021) that showed that intrinsic motivation was positively related to work engagement and negatively to burnout. More specifically, intrinsic motivation showed to be the strongest predictor of employee well-being (such as work engagement and burnout), compared to other types of motivation as it explained more than 50% of the variance in burnout, work engagement, job satisfaction, turnover intention, and absenteeism in comparison to other types of motivation (Van den Broeck et al., 2021).

Therefore, we argue that when nurses can draw upon sufficient resources, they are likely to experience joy and pleasure while working, hence fostering their intrinsic motivation. Presumably, as a result, they are more likely to become vigorous, dedicated, and absorbed in their work tasks (Bakker and Demerouti, 2008; Weibel et al., 2007; Xanthopoulou et al., 2009). In contrast, when nurses face unfavorable working conditions that are simply too stressful to manage and to cope with, they are expected to become unmotivated, making them more vulnerable to become exhausted, eventually burning out. In short, we posit that intrinsic motivation will mediate the relationship of job resources and job demands with both work engagement and burnout.

1.2. The buffering effect of job resources

Another focus of this study is to examine the boundary conditions by which working conditions influence nurses' well-being. In other words, we aim to specify when the relation of job demands with burnout and intrinsic motivation changes in strength or direction depending on the presence of job resources (Busse et al., 2017). Most studies highlight the negative impact of excessive job demands, whereas a few report positive associations between job stressors and e.g. work motivation. The latter might be because they interact with other job characteristics. In line with the JD-R and Karasek's Job Demand-Control model (JDC; Karasek, 1979), a number of studies suggest that the presence of high job demands is not necessarily problematic for employees' motivation and well-being when they perceive opportunities to effectively cope with high demands (Van Yperen et al., 2016; Van Yperen and Hagedoorn, 2003; Xanthopoulou et al., 2007). Accordingly, it is not high demands per se, but high demands in combination with a lack of job resources that might undermine nurses' well-being and make them more vulnerable to develop feelings of exhaustion ("strain hypothesis"). On the other hand, when high job demands occur in alliance with high job resources, nurses feel enabled to effectively cope with these demands ("activation hypothesis"). Even more, they are presumed to perceive their jobs as intrinsically motivating and stimulating (Karasek and Theorell, 1990). In a demanding work environment enhancing job resources seems therefore beneficial as it may not only decrease stress but may also increase nurses' intrinsic motivation. This, in fact, may have important implications particularly for hospitals where nurses have to cope with high workload that, combined with other work-related factors, may have severe consequences not only for their own physical and psychological health but also for their patients' safety (Aiken et al., 2009, 2001; Janssen et al., 1999).

A few studies provide support for the activation hypothesis (De Jonge et al., 1999; Hu et al., 2011; Van Yperen and Hagedoorn, 2003). For instance, a study on Dutch nurses showed that high job demands combined with high job resources were positively related to work motivation, indicating that job demands can be simulating and motivating when sufficient resources are available to cope with these stressors (De Jonge et al., 1999). Similar findings were reported by Van Yperen and Hagedoorn (2003). In contrast, empirical evidence of the strain hypothesis is less consistent (De Lange et al., 2003; Häusser et al., 2010; Van Der Doef and Maes, 1999). A review by De Lange et al. (2003) showed that only 8 of the 19 studies included (42%) provided support for the strain hypothesis. The authors also noted that previous research predominantly focused on job control and social support as a potential buffer against certain types of job demands (i.e. workload and time pressure). Yet, only a few included more general job characteristics (Bakker et al., 2005; Hu et al., 2011).

The majority of studies largely focused on the strain hypothesis in relation to health outcomes while the activation hypothesis received only little research attention, particularly in relation to work motivation (Parker and Sprigg, 1999; Vangrieken et al., 2022). Thus, an interesting question that remains is whether job resources may not only promote employees' intrinsic motivation (as described above) but also if they interact with job demands. The present study was designed to extend the existing research by including a broader range of job specific demands and resources and by focusing on both, the strain and activation hypotheses in relation to burnout and work motivation. Specifically, we propose that high demands will be associated with higher levels of burnout, particularly when job resources are low (strain hypothesis). In addition, it is expected that high job demands will be associated with higher levels of intrinsic motivation, particularly when job resources are high (activation hypothesis).

1.3. Hypotheses

Drawing on the postulates of SDT, we posit that intrinsic motivation plays a mediating role in both the health impairment and motivational processes of the JD-R model (Fig. 1). To validate and extend existing

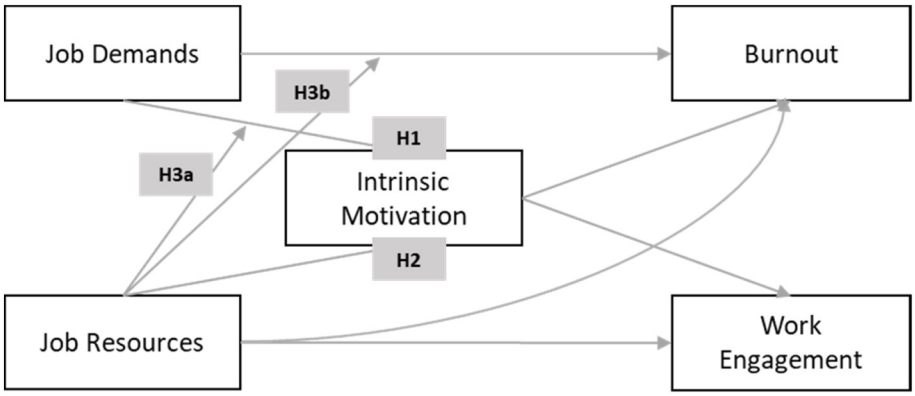

Fig. 1. A moderated mediation of the Job Demands-Resource model.

research, the present study further seeks to examine if job resources moderate the relationship of job demands with a) intrinsic motivation and b) burnout. More specifically, we hypothesize:

H1. Intrinsic motivation mediates the relationship of job demands with 1a) burnout and 1b) work engagement.

H2. Intrinsic motivation mediates the relationship of job resources with 2a) work engagement and 2b) burnout.

H3. Job resources moderate the relationship of job demands with 3a) intrinsic motivation (activation hypothesis) in such a way that the relationship will be enhanced when job resources are high and 3b) burnout (strain hypothesis), i.e. in such a way that the relationship will be enhanced when job resources are low.

2. Methods

2.1. Data collection and participants

This study uses a cross-sectional data set of direct care nurses (n = 1729) from general acute care hospitals (n = 14) in the Flemish region of Belgium. In 2019, Belgium counted a total of 103 general hospitals of which 50% (or 52 hospitals) were located in Flanders (Federal Public Service, 2019). In relation to nursing staff, 214,374 professional practitioners were licensed to practice nursing in Belgium. Of these licensed professionals, 35% (or 76,272) were practicing in the Flemish healthcare sector of which 68% (52,174) worked in hospitals (Federal Public Service, 2022).

Data collection took place by means of online questionnaires between October 2020 and July 2021. A total of 5889 registered nurses were invited to participate in a survey that aimed to assess their working environment, motivation and well-being in the context of the Horizon 2020-funded Magnet4Europe project (Sermeus et al., 2022). Eligible nursing staff was identified and recruited by the Magnet4Europe coordinator who was nominated as a liaison in each participating hospital. Registered nurses were eligible and invited to participate in the survey if 1) they had direct patient contact, 2) met the minimum qualifications as specified by the Directive 2013/55/EU amending Directive 2005/36/EC on the recognition of professional qualifications, and 3) worked on adult inpatient units including intensive care units (ICU) and the emergency room (ER). Excluded were nurses from specialized units such as neonatology, pediatrics, obstetrics, psychiatry, operating room, pathology, microbiology, radiology, and medical imaging.

Of the 5889 questionnaires sent, 2060 were filled in and returned, which yielded a response rate of 35%. To keep the work situation rather constant, this study focused on nursing staff in the same job level, i.e. direct care nurses (De Jonge et al., 1999). Direct care nurses were defined as nurses primarily active on units and working in direct contact with patients. Therefore, the final data set consisted of 1729 observations. 83% of respondents were female, the average age was 38 years (sd = 12) and they had been working in their current workplace for 12 years on average (sd = 11). In addition, we included direct care nurses from all types of departments. The majority were working in intensive care (22.5%), followed by nurses active on surgical (19.7%), internal (17.3%), and geriatric (14.6%) units. With regard to gender and age, the sample distribution of this study was similar to the active nursing population in the Flemish region of Belgium. According to the most recent available data from 2018, provided by the Belgian Federal Public Service, the majority of nurses are female (85%) and between 25 and 54 years old. No data for the Flemish nursing population are available with respect to organizational tenure or units.

2.2. Measures

We used previously validated scales in this study which were available in Dutch (the primary spoken language in participating hospitals). A description of each scale is presented below.

2.2.1. Job demands and resources

The questionnaire included a set of items to assess different job demands and job resources, mostly derived from the Questionnaire on the Experience and Evaluation of Work (QEEW, in Dutch VBBA) (Van Veldhoven et al., 2020) and the Nordic Questionnaire for Psychological and Social Factors (NQPS) (Dallner et al., 2000). Job Resources included autonomy (1-item), performance feedback (3-items), skill use (1-item), opportunities for growth and development (1-item), and value congruence (1-item). Example items were: "Can you decide when you perform your work?" (Autonomy) and "Does your supervisor provide information about how well you perform your job?" (Performance feedback). Job demands included role conflicts (3-items), workload (4-items), red tape (1-item), and emotional demands (1-item). Example items were: "Do you have too much work to do?" (Workload) and "I receive incompatible requests from two or more people." (Role conflicts). All items were rated on a five-point Likert scale ranging from seldom (1) to always (5). For both, job demands and job resources, composite scores were generated, i.e. scores on the four job resources as well as on the four job demands were each compiled into one mean score (see Table 1). A higher score indicated that nurses' experience more job demands (or resources) to be present in their work environment.

2.2.2. Burnout

The short version of the Burnout Assessment Tool (BAT), a novel self-report questionnaire (Schaufeli et al., 2020), was used to assess the presence of core burnout syndromes (i.e., exhaustion, mental distance, cognitive, and emotional impairment) among nursing staff. The short version (Hadžibajramović et al., 2022) consists of 12-items that could be scored on a five-point Likert scale ranging from never (1) to always (5). A high score indicates high levels of burnout. Example items are "After a day at work, I find it hard to recover my energy" (Exhaustion) and "I struggle to find any enthusiasm for my work" (Mental distance).

Table 1
Means, standard deviations, internal consistencies, minimum and maximum values, and Correlations of the study variables.

Concept (# of items)	Mean	SD	α	Min.–max.	Correlations					
					1	2	3	4	5	6
1. Age	38	12		19–64						
2. Gender	/	/	/	/	−0.029					
3. Job demands (9)	3.35	0.49	0.829	1.44–4.89	−0.054*	−0.011				
4. Job resources (7)	3.32	0.57	0.806	1.43–5.00	−0.094**	−0.018	−0.312**			
5. Intrinsic motivation (3)	3.90	0.60	0.824	1.00–5.00	−0.204**	−0.007	−0.162**	0.401**		
6. Work engagement (3)	3.66	0.63	0.824	1.33–5.00	−0.001	0.023	−0.269**	0.537**	0.500**	
7. Burnout (12)	2.11	0.55	0.897	1.00–4.25	−0.015	0.105**	0.515**	−0.411**	−0.382**	−0.541**

Note: **Correlation is significant at the 0.01 level (2-tailed), gender was coded 1 = male and 2 = female. All constructs were rated on a five-point Likert scale ranging from 1 = seldom/completely disagree to 5 = always/completely agree.

2.2.3. Work engagement

Work engagement was assessed using three items from the Dutch version of the Utrecht Work Engagement Scale (UWES, Schaufeli et al., 2019), rated on a five-point Likert scale ranging from seldom (1) to always (5). A high score is indicative of high levels of engagement. An example item was "I am enthusiastic about my work" (Dedication).

2.2.4. Intrinsic motivation

Intrinsic motivation was measured with the Work Extrinsic and Intrinsic Motivation Scale (WEIMS, Tremblay et al., 2009). Using the WEIMS, intrinsic motivation is measured with three items, rated on a five-point Likert scale ranging from completely disagree (1) to completely agree (5). A high score indicates high levels of intrinsic motivation. An example item was "For the satisfaction I experience when I am successful at doing difficult tasks".

2.3. Data analysis

To test the hypothesized models, we used structural equation modeling (SEM) with maximum likelihood estimation methods using the software program Mplus 8.6 (Muthén and Muthén, 2017). We followed the two-stage approach of Anderson and Gerbing (1988) by testing the measurement model first and then the hypothesized structural model. In terms of fit statistics, the comparative fit index (CFI) and Tucker–Lewis index (TLI) were considered as indices to assess how well the hypothesized measurement model fits to the data (Brown, 2015; Hu and Bentler, 1999). Values above 0.90 indicated a good model fit (van de Schoot et al., 2012). In addition, the root mean squared error of approximation (RMSEA) and standardized root mean residual (SRMR) were considered; these values should ideally be below 0.08.

Next, we tested the hypothesized structural model following a two-step approach (Klein and Moosbrugger, 2000). First, we assessed the fit of the mediation model without the hypothesized interaction (H1–H2). In addition, bootstrapping with 1000 bootstrapped samples was applied to determine the point estimate and bias-corrected and accelerated 95% confidence interval (CI) of the total and specific indirect effect. Bootstrapping is recommended as the indirect effect (the product of the coefficients of the predictor and mediator variable) is not normally distributed (Stride et al., 2017). Accordingly, statistical significance of the indirect effect was tested by computing the bias-corrected confidence interval around the indirect effect obtained from a bootstrapping analysis. A bootstrapped confidence interval (lower level of confidence interval – upper level of confidence interval, LLCI – ULCI) that does not contain zero is indicated as statistically significant. Second, we tested the moderated mediational model (H3) using maximum likelihood parameter estimates that could generate estimates with standard errors robust to non-normality of observed variables (Muthén and Muthén, 2017). To establish the interaction effect of job demands and job resources, both variables were mean-centered and the interactions were probed +1 SD above and −1 SD under the mean of the moderator (i.e. job resources).

2.4. Ethics approval

The study described herein is embedded in a large interventional study that is funded under the European Union's Horizon 2020 Research and Innovation program from 2020 to 2023 (Grant Agreement 848031) (Sermeus et al., 2022). The protocol of Magnet4Europe is registered in the ISRCTN registry (ISRCTN10196901). Ethical clearance to conduct the Magnet4Europe has been obtained from the central ethics committee in participating countries. In Belgium ethical approval has been obtained from the Ethics Committee Research UZ/KU Leuven (S64213).

Data collection took place using an online data collection platform to which invited nurses had to register prior to their participation in the survey. Prior to the survey launch, the Magnet4Europe coordinators received the survey link as well as information and recruitment material that had to be shared with eligible nursing staff. After registration, participants followed a process of informed consent that explained the objective of the study and that all data would be kept confidentially. Every participant had to agree to participate in the study before they could continue and engage in the survey. Data was processed in line with the General Data Protection Regulation 2016/679 of the European Union. Each record of informed consent was managed and stored through the online platform. Data was pseudonymized to ensure non-attribution to an identified or identifiable person; at no point in time during the study it would have been possible to draw any conclusions about a single person's identity.

3. Results

3.1. Test of measurement model

First, we conducted a confirmatory factor analysis (CFA) to test whether measures of the constructs included are consistent with the expected underlying structure. The measurement model consisted of five correlated latent variables: burnout (a second-order factor represented by its four dimensions exhaustion, mental distance, cognitive impairment, and emotional impairment; each represented by their three corresponding items), work engagement (a first-order factor represented by its three items), intrinsic motivation (a first-order factor represented by its three items), job demands (a first-order factor represented by items assessing workload, role conflicts, emotional demands, and bureaucracy), and, lastly, job resources (a first-order factor represented by items assessing autonomy, performance feedback, skill use, opportunities for growth and development, and value congruence).

The results of the CFA indicated a good fit of our hypothesized measurement model, with χ^2 (310) = 1383.035, CFI = 0.95, TLI = 0.94, RMSEA = 0.05, and SRMR = 0.05. Moreover, all indicators showed significant factor loadings on their respective latent factors ($p < .001$) with λ values ranging from 0.45 to 0.89. Mean factor loadings of items assessing the different constructs were satisfactory with values of 0.63 (Job Demands), 0.63 (Job Resources), 0.76 (Burnout), 0.78 (Work Engagement), and 0.79 (Intrinsic Motivation). A reliable measurement model was therefore obtained.

3.2. Descriptive results

The means, standard deviations (SD), minimum and maximum values as well as correlations, and internal consistencies for all constructs are presented in Table 1. All correlations among the variables were significant and relationships in the hypothesized direction. In addition, we used correlational analyses to verify the associations between the sociodemographic variables (i.e. age and gender) and the variables of our model. Age significantly correlated weakly with job demands and resources and intrinsic motivation while gender only showed a weak but significant correlation with burnout. In addition, when including these variables as controls, the hypothesized effects did not change substantially. Therefore, to aid clarity, we report the most parsimonious analysis without including age and gender as control variables (Cohen et al., 2014).

3.3. Analysis of the moderated mediation model

In a first step, we tested the main assumptions of the JD-R model (cfr. Table 2). Consistent with the model, we found a positive relationship of job demands with burnout ($\beta = 0.484$, $p < .001$) as well as a positive relationship of job resources with work engagement ($\beta = 0.630$, $p < .001$). In addition, and in accordance with the JD-R model job resources were negatively related to burnout ($\beta = -0.355$, $p < .001$).

Our first hypotheses predicted that the relationship of job demands with burnout and work engagement would be mediated by intrinsic

Table 2
Research model – moderated mediation results.

Model	Outcome	Variable/effect	β	ρ	LLCI	ULCI
1	Burnout	Job demands	0.484	0.000	0.411	0.548
		Job resources	−0.355	0.000	−0.423	−0.290
	Work engagement	Job resources	0.630	0.000	0.574	0.682
		Job demands	−0.079	0.020	−0.147	−0.012
2	Motivation	Job demands	0.007	0.846	−0.067	0.078
(Mediation)		Job resources	0.512	0.000	0.447	0.575
	Burnout	Intrinsic motivation	−0.264	0.000	−0.325	−0.207
		Job demands (direct)	0.485	0.000	0.414	0.548
		(Indirect via intrinsic motivation)	−0.002	0.847	−0.022	0.016
		Job resources (direct)	−0.221	0.000	−0.287	−0.150
		(Indirect via intrinsic motivation)	−0.135	0.000	−0.178	−0.102
	Work engagement	Intrinsic motivation	0.333	0.000	0.272	0.388
		Job resources (direct)	0.461	0.000	0.395	0.524
		(Indirect via intrinsic motivation)	0.170	0.000	0.139	0.205
		Job demands (direct)	−0.080	0.012	−0.144	−0.017
		(Indirect via intrinsic motivation)	0.002	0.847	−0.023	0.026
3	Motivation	Job demands	0.008	0.821	−0.060	0.075
(Moderated mediation)		Job resources	0.513	0.000	0.453	0.575
		Interaction job demands × job resources	−0.004	0.870	−0.055	0.047
	Burnout	Intrinsic motivation	−0.264	0.000	−0.320	−0.208
		Job demands (direct)	0.489	0.000	0.414	0.548
		(Indirect via motivation)	−0.002	0.847	−0.022	0.016
		Job resources (direct)	−0.216	0.000	−0.282	−0.150
		(Indirect via motivation)	−0.135	0.000	−0.178	−0.102
		Interaction job demands × job resources	−0.039	0.045	−0.077	−0.001
	Work engagement	Intrinsic motivation	0.332	0.000	0.277	0.386
		Job resources (direct)	0.462	0.000	0.399	0.525
		(Indirect via motivation)	0.170	0.000	0.139	0.205
		Job demands (direct)	−0.081	0.029	−0.138	−0.023
		(Indirect via intrinsic motivation)	0.002	0.847	−0.023	0.026

Note: β = standardized beta, LLCI = lower level of bootstrap confidence interval, ULCI = upper level of bootstrap confidence interval.

mediation. We found that the indirect effect of job demands on burnout via intrinsic motivation ($\beta = -0.002$) was not statistically significant according to the bootstrap CI 95% (−0.022, 0.016). With regard to work engagement, also the indirect effect of job demands via intrinsic motivation ($\beta = 0.002$) was not statistically significant according to the bootstrap CI 95% (−0.023, 0.026). These results do not support H1a and H1b.

In relation to job resources, we found an indirect effect on work engagement via intrinsic motivation ($\beta = 0.170$) which was statistically significant according to the bootstrap CI 95% (0.139, 0.205). The results further indicated an indirect effect of job resources on burnout via intrinsic motivation ($\beta = -0.135$) which was statistically significant according to the bootstrap CI 95% (−0.178, −0.102). In addition, the results indicated that, after including intrinsic motivation as mediator, job resources had a direct effect on both, work engagement ($\beta = 0.462$, $p < .001$) and burnout ($\beta = -0.216$, $p < .001$). In short, the results indicated a partial mediation of intrinsic motivation in the relationship of job resources with both, work engagement (H2a) and burnout (H2b). Against expectations, they did not support the hypothesized mediating effect of intrinsic motivation in the relationship of job demands with burnout (H1a) and work engagement (H1b).

Our last set of hypotheses predicted that the relationship of job demands with intrinsic motivation (H3a) and burnout (H3b) would be moderated by job resources. With regard to H3a, we found a moderating effect of $\beta = -0.004$ for job resources on the relationship of job demands with intrinsic motivation. This effect was not statistically significant according to the bootstrap CI 95% (−0.055, 0.047) indicating that there is no moderating effect for job resources on the respective relationship. Considering the relationship of job demands with burnout, our results show a moderating effect of $\beta = -0.039$ for job resources which was statistically significant according to the bootstrap CI 95% (−0.077, −0.001). Hence, while the results do not support H3a (activation hypothesis), we could find confirmation for H3b (strain hypothesis). Fig. 2 shows the interaction between demands and resources on nurses' burnout.

The results obtained from the moderated mediation analysis are presented in Fig. 3.

4. Discussion

Drawing on the postulates of SDT, the aim of this study was to investigate the mediating role of intrinsic motivation in the JD-R model. To validate and extend the existing research, the present study further sought to examine if job resources moderate the relationship of job demands with a) intrinsic motivation and b) burnout. The results of the structural equation modeling analyses partially support our theoretical model. Overall, the findings highlight the importance of intrinsic motivation and its role in relation to job resources and nurse well-being. First and foremost, the pattern of our results is in line with what has been suggested by previous studies: job resources appear to be the most crucial factor for nurse well-being whereas job demands remain an essential factor that harms their psychological health. Consistent with the general assumptions of the JD-R model (Demerouti et al., 2001; Schaufeli and Bakker, 2004) and in line with previous research on health professionals (e.g. Jourdain and Chênevert, 2010; Keyko et al., 2016; Kutney-Lee et al., 2013; Lee and Akhtar, 2011; Stimpfel et al., 2012), we found a positive relationship of job demands with burnout as well as a positive relationship of job resources with work engagement. In addition, job resources were negatively related to burnout.

4.1. Intrinsic motivation and job demands

The results of the mediation effect analysis only showed partial support for our assumptions. Against our expectations, the findings did not confirm a mediating effect of intrinsic motivation in the relationship of job demands with burnout and work engagement (H1a). A possible explanation for these results is that the relationships may be influenced by other motivational factors that nurses experience. According to SDT, different types of motivation can be ordered along a continuum of self-determination (ranging from more controlled to more autonomous

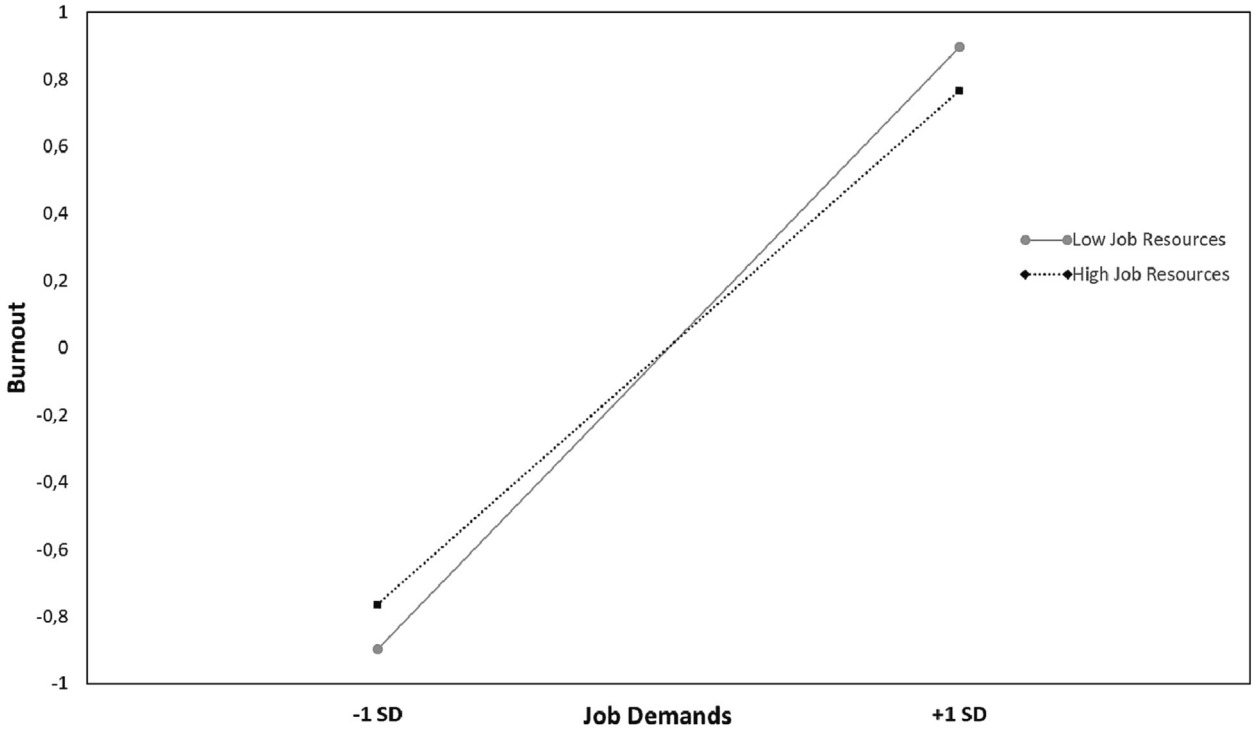

Fig. 2. Interaction between job demands and job resources on burnout.

motivation), i.e. people may choose from an array of different reasons (extrinsic or intrinsic) on how to invest their time and energy on certain behaviors and activities (Deci et al., 2017). While being intrinsically motivated means doing an activity out of inherent interest or pleasure, extrinsic motivation drives people to engage in an activity to obtain a separable outcome. Amotivation, in addition, is considered as a lack of motivation (i.e. people show no engagement into certain behaviors or activities) and has been shown to yield only negative health outcomes, such as distress, burnout, and low performance (Van den Broeck et al., 2021). In order to understand the full impact of work motivation on employee functioning at work, future research might benefit from examining the mediating effects of other motivational types such as controlled motivation as part of extrinsic motivation. In addition, researchers recommended to include the full SDT continuum along with amotivation in order to provide a more nuanced understanding of motivation in the workplace (Van den Broeck et al., 2021). Another possible explanation is that the relations between demands and motivation vary with the nature of the demand. More specifically, theory and research on job characteristics suggests that some demands may also have a positive connotation and therefore, demands should be categorized into two types, namely job hindrances and job challenges (LePine et al., 2005; Podsakoff et al., 2007; Van den Broeck et al., 2010). While both types still tend to be demanding, challenges may also have the potential to promote mastery and goal achievement as they may motivate workers to invest in their work. In contrast, hindrances may thwart learning, and goal attainment and even more, wear out workers' energy. Indeed, a number of studies confirm the opposite effect of challenge and hindrance demands on motivation (LePine et al., 2005; van Oortmerssen et al., 2020). In this study, no distinctions have been made in relation to job demands, also, no associations between demands and intrinsic motivation were observed. However, job demands were – after including intrinsic motivation - still positively associated with burnout and negatively related to work engagement. These results suggest that nursing staff perceived job demands as hindrances rather than as challenges. Future research on job stress might benefit from exploring the distinctive effects of job hindrances and challenges on motivation and well-being.

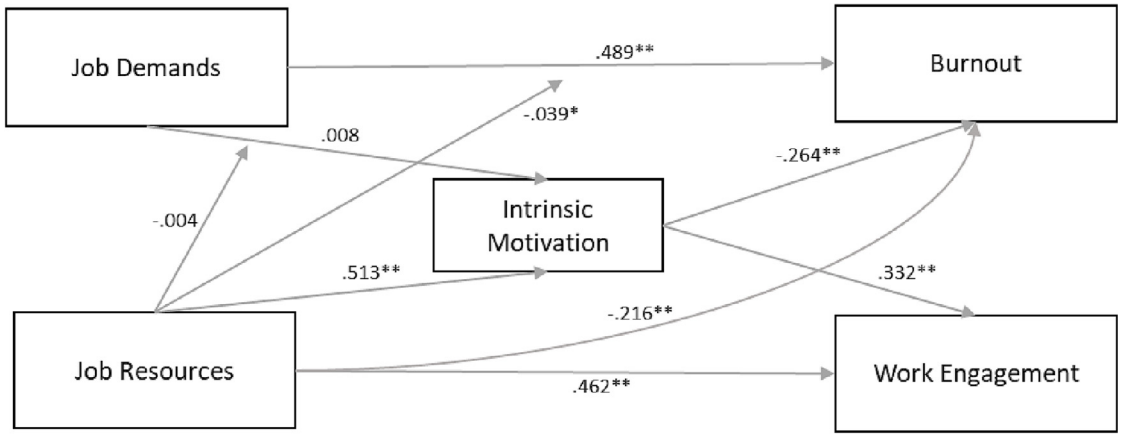

Fig. 3. Structural model of the relationships between job characteristics, intrinsic motivation and job well-being outcomes. Coefficients represent standardized estimates. *p < .05; **p < .001.

4.2. Intrinsic motivation and job resources

Our results further showed that intrinsic motivation partially mediated the relationship of job resources with both, work engagement and burnout (H2). While our findings largely support the main assumptions of JD-R model, they also highlight the importance of work motivation as personal resource in the motivational process between job resources and work engagement. More specifically, they indicate that nurses who perceive sufficient job resources such as feedback, autonomy and opportunities for development, are likely to become intrinsically, i.e. autonomously motivated at work. This, in turn, will enable them to allocate and balance their resources (e.g., attention, effort, and time spend on certain activities) in a more constructive and healthy way. As a result, they will not only experience more joy and pleasure while working but also become more vigorous, dedicated, and absorbed in their work tasks. At the same time, it will prevent them from severe and enduring job-related strain and burning out. Similar findings have been reported in previous studies (Janssen et al., 1999; Toode et al., 2015, 2011; Trépanier et al., 2015). A question that remains is why work motivation showed significant association with job resources but not with job demands. First, our results suggest that job demands are perceived as hindrance rather than as challenge stressors. Second, a possible explanation is that the relationship between job characteristics and work motivation may be influenced by other (underlying psychological) mechanisms. A main premise of SDT is that employees are optimally motivated and likely to feel better to the extent that their three innate psychological basic needs for autonomy, competence, and relatedness are satisfied (Ryan and Deci, 2000a). While the satisfaction of these basic needs is expected to enhance employees' intrinsic motivation, frustration of any of these needs, on the other hand, is considered as damaging to work motivation (Ryan and Deci, 2020). Thus, a promising avenue would be to investigate whether basic need satisfaction and/or frustration could explain the relationship between job characteristics and work motivation.

4.3. The buffering effect of job resources

Lastly, we found only partial support for H3. Consistent with the JD-R and earlier stress models, low job resources strengthened the adverse effect of job demands on nurses' burnout (H3a). Alternatively stated, high job resources showed to have a buffering effect on the respective relationship, particularly when job demands were high. However, similar to previous studies which examined the interaction effect of job demands and resources on health-related outcomes, the moderation effect observed in this study was rather weak ($\beta = -0.039$) (e.g. Hu et al., 2011). Furthermore, against our expectations, we found no support for the activation hypothesis, i.e. high job resources combined with high job demands will increase nurses' intrinsic motivation. It is difficult to verify to which extent these findings truly reflect the results of previous research as, to our knowledge, only a few studies have investigated the activation hypothesis so far. For instance, Van Yperen and Hagedoorn (2003) showed that high job control is needed to enhance intrinsic work motivation, particularly when job demands are high and social support is low. In contrast, the findings e.g. reported by Taris et al. (2003) hardly support the activation hypothesis as proposed by Karasek and Theorell (1990). A more general explanation could be that our job demands and resources did not match well. Indeed, researchers have noted that demands from a specific domain will only interact with resources from the same domain (Daniels and de Jonge, 2010). It would be interesting to see if future studies using other better-matched, job-specific demands and resources from the same domain provide support for the activation hypothesis.

4.4. Limitations

Naturally, the present research has some limitations that are worth mentioning. A first limitation is the cross-sectional nature of the study which clearly limits causal conclusions. Particularly in relation to the strain hypothesis, researchers have identified the cross-sectional design as a factor influencing the robustness of the buffering effect (Xu and Payne, 2020). From a theoretical point of view, however, it is unclear whether the strain as well as activation hypothesis occur in the short or long-term, or both. Longitudinal studies are needed to answer this question. Second, in order to reduce respondent's burden, this study used several single-item scales from existing validated instruments to measure job demands (i.e. emotional demands, bureaucracy) and job resources (i.e. autonomy, skill use, opportunities for growth and development, value congruence). Internal consistencies of both scales, however, were beyond the usual criterion of 0.70, with values of $\alpha = 0.829$ (job demands) and $\alpha = 0.811$ (job resources). While there is usually a strong preference in occupational research for multiple-item measures over single-measures, a recent study by Fisher et al. (2016) indicated the validity of several single-item measures, such as job control. Another limitation in relation to our measures is that all concepts included in this study were obtained through self-reports. As such, the strength of the effects reported here may have been biased due to common-method variance or because of the wish to answer consistently (Conway, 2008). This may be resolved in future research by including "objective" indicators of job characteristics such as shift work, average hours worked per week, staffing levels. In addition, a number of studies indicated that some groups of individuals seem particularly vulnerable (or resistant) to unfavorable work conditions. Another route for future research could be to explore the role of individual differences (self-efficacy, proactivity, coping style) in the relationship between work environment, motivation and well-being (Parker and Sprigg, 1999; Xu and Payne, 2020). Lastly, the sample return rate (35%) which raises concerns around sampling bias and generalizability. In addition, the current study employed a sample of direct care nurses working in Belgian hospitals ($n = 14$) which puts some limits on the generalization of our findings. A comparison of our sample with data provided by the Belgian Public Federal Services however showed that our sample was representative for the Flemish nursing population with respect to age and gender. Yet, a replication of our study with e.g. other occupational groups or within other countries would strengthen our conclusions.

4.5. Implications for practice

Despite these limitations, we believe that our study has some important implications. Overall, our results support what often has been shown in the past: work environments in which nurses experience high job demands but insufficient resources to cope with these demands bear the highest risk for burnout, reduced well-being, and illness. In particular, they indicate that hospitals should invest in interventions aimed at reducing job demands and increasing job resources. Following a JD-R based approach, Bakker et al. (2014) propose a combination of trainings and job re-design. For instance, to reduce job demands (such as workload and red tape), hospitals should monitor nurse staffing levels and the amount of administrative paperwork across units and shifts (Ellenbecker et al., 2006; Teoh et al., 2023). In relation to emotional demands, nurses may also benefit from trainings where they learn how to set boundaries and seek for emotional support when dealing with emotionally demanding situations (e.g. treating patients with severe diseases) (Kinman and Leggetter, 2016). However, from a practical point of view, it is important to note that it might be difficult to eliminate all job demands present in the work environment. Particularly in healthcare, professionals are frequently confronted with high levels of workload and emotionally demanding situations (Trépanier et al., 2015). Therefore, hospitals should focus on interventions aimed at building job resources as they show strong associations with nurses' intrinsic motivation and their well-being. For instance, job resources such as performance feedback can be optimized through job crafting, e.g. the nurse proactively asks the manager or colleague for feedback (Gordon et al., 2018). In order to increase autonomy and opportunities for growth and development, hospitals may invest in (team) workshops

fostering trust, respect, and collegial relationships. In a similar vein, hospitals may encourage their staff to participate in decision-making processes e.g. related to patient care and shift planning. Lastly, having continuous access to adequate training and other educational resources will allow nursing staff to learn and to grow (Tourangeau et al., 2017; Vander Elst et al., 2016). Taken together, by fostering a positive work environment through enhanced job resources, it seems possible to foster work motivation and engagement and to reduce perceived job strain thereby creating a healthy work environment for direct care nurses.

5. Conclusions

A highly demanding work environment can be a source of significant stress which may put nurses' health at severe risk. Nurses who perceive sufficient job resources such as feedback, autonomy and opportunities for growth and development, are likely to feel intrinsically motivated at work. In addition, it will foster their work engagement and prevent them from burning out, particularly when job demands are high.

Funding

This study is funded by the European Union's Horizon 2020 research and innovation program under the project Magnet4Europe: Improving Mental Health and Wellbeing in the Health Care Workplace (Grant Agreement Number 848031), starting 1 January 2020 until 31 December 2023. The investigation presented here is the responsibility of the authors only. The EU Commission takes no responsibility for any use made of the information set out.

CRediT authorship contribution statement

Dorothea Kohnen: Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Hans De Witte:** Conceptualization, Methodology, Writing – review & editing. **Wilmar B. Schaufeli:** Conceptualization, Methodology, Writing – review & editing. **Simon Dello:** Data curation, Validation, Writing – review & editing. **Luk Bruyneel:** Supervision, Validation, Writing – review & editing. **Walter Sermeus:** Project administration, Supervision, Validation, Writing – review & editing.

Data availability

Individual participant data that underlie the results reported in this article, after deidentification, will be shared with researchers who provide a methodologically sound proposal.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The Magnet4Europe Consortium consists of Walter Sermeus (director), Luk Bruyneel, Hans De Witte, Wilmar B. Schaufeli, Simon Dello, Dorothea Kohnen (Belgium, Catholic University Leuven); Linda Aiken (codirector), Matthew McHugh, Colleen A. Pogue, Mary DelGuidice, Herbert Smith, Timothy Cheney, Douglas Sloane (USA, University of Pennsylvania); Reinhard Busse, Claudia Maier, Julia Köppen, Joan Kleine (Germany, Technical University Berlin); Jonathan Drennan (Ireland, University College Dublin); Vera McCarthy, Elaine Lehane, Noeleen Brady, Anne Scott (Ireland, University College Cork); Ingeborg Strømseng Sjetne (Norway, Norwegian Institute of Public Health); Anners Lerdal (Norway, Lovisenberg Diaconal Hospital); Lars E. Eriksson, Rikard Lindqvist, Lisa Smeds Alenius, Ingrid Svensson, Ann Jacobsson (Sweden, Karolinska Institute); Jane Ball, Peter Griffiths, Jackie Bridges, Sydney Anstee, Jaimie Ellis (England, University of Southampton); Anne Marie Rafferty (England, King's College London); Martin McKee (England, London School of Hygiene and Tropical Medicine); Paul Van Aken, Danny Van Heusden, Kaat Siebens, Peter Van Bogaert (Belgium, University Hospital Antwerp), Oliver Sergeant (Meplis NV).

References

Aiken, L.H., Clarke, S.P., Sloane, D.M., Sochalski, J.A., Busse, R., Clarke, H., Giovannetti, P., Hunt, J., Rafferty, A.M., Shamian, J., 2001. Nurses' reports on hospital care in five countries. Health Aff. 20, 43–53. https://doi.org/10.1377/hlthaff.20.3.43.

Aiken, L.H., Clarke, S.P., Sloane, D.M., Lake, E.T., Cheney, T., 2009. Effects of hospital care environment on patient mortality and nurse outcomes. J. Nurs. Adm. 39, 223–229. https://doi.org/10.1097/NNA.0b013e3181aeb4cf.

Anderson, J.C., Gerbing, D.W., 1988. Structural equation modeling in practice: a review and recommended two-step approach. Psychol. Bull. 103, 411.

Bakker, A.B., Demerouti, E., 2008. Towards a model of work engagement. Career Dev. Int. 13, 209–223. https://doi.org/10.1108/13620430810870476.

Bakker, A.B., Demerouti, E., Euwema, M.C., 2005. Job resources buffer the impact of job demands on burnout. J. Occup. Health Psychol. 10, 170–180. https://doi.org/10.1037/1076-8998.10.2.170.

Bakker, A.B., Demerouti, E., Sanz-Vergel, A.I., 2014. Burnout and work engagement: the JDR approach. Annu. Rev. Organ. Psych. Organ. Behav. 1, 389–411. https://doi.org/10.1146/annurev-orgpsych-031413-091235.

Beckers, D.G.J., Van Der Linden, D., Smulders, P.G.W., Kompier, M.A.J., Van Veldhoven, M.J. P.M., Van Yperen, N.W., 2004. Working overtime hours: relations with fatigue, work motivation, and the quality of work. J. Occup. Environ. Med. 46, 1282–1289. https://doi.org/10.1097/01.jom.0000147210.95602.50.

Brown, T.A., 2015. Confirmatory Factor Analysis for Applied Research. Guilford publications, New York, NY.

Busse, C., Kach, A.P., Wagner, S.M., 2017. Boundary conditions: what they are, how to explore them, why we need them, and when to consider them. Organ. Res. Methods 20, 574–609. https://doi.org/10.1177/1094428116641191.

Cohen, P., Cohen, P., West, S.G., Aiken, L.S., 2014. Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. Psychology press https://doi.org/10.4324/9781410606266.

Conway, J.M., 2008. Method variance and method bias in industrial and organizational psychology. Handb. Res. Methods Ind. Organ. Psychol. 344–365. https://doi.org/10.1002/9780470756669.ch17.

Dallner, A., Elo, A.-L., Gambrele, F., Hottinen, V., Knardahl, S., Linstrom, K., Skogstad, A., Orhede, E., 2000. Validation of the General Nordic Questionnaire for Psychological and Social Factors at Work, Innovative Theories, Tools, and Practices in Work and Organizational Psychology. Nordic Council of Ministers, KÃ¸benhavn.

Daneshkohan, A., Zarei, E., Mansouri, T., Maajani, K., Ghasemi, M.S., Rezaeian, M., 2015. Factors affecting job motivation among health workers: a study from Iran. Global J. Health Sci. 7, 153–160. https://doi.org/10.5539/gjhs.v7n3p153.

Daniels, K., de Jonge, J., 2010. Match making and match breaking: the nature of match within and around job design. J. Occup. Organ. Psychol. 83, 1–16. https://doi.org/10.1348/096317909X485144.

De Jonge, J., Van Breukelen, G.J.P., Landeweerd, J.A., Nijhuis, F.J.N., 1999. Comparing group and individual level assessments of job characteristics in testing the job Demand-Control Model: a multilevel approach. Hum. Relat. 52, 95–122. https://doi.org/10.1023/A:1016924517061.

De Lange, A.H., Taris, T.W., Kompier, M.A.J., Houtman, I.L.D., Bongers, P.M., 2003. "The very best of the millennium": longitudinal research and the demand-control-(support) model. J. Occup. Health Psychol. 8, 282–305. https://doi.org/10.1037/1076-8998.8.4.282.

Deci, E.L., Olafsen, A.H., Ryan, R.M., 2017. Self-determination theory in work organizations: the state of a science. Annu. Rev. Organ. Psych. Organ. Behav. 4, 19–43. https://doi.org/10.1146/annurev-orgpsych-032516-113108.

Demerouti, E., Nachreiner, F., Bakker, A.B., Schaufeli, W.B., 2001. The job demands-resources model of burnout. J. Appl. Psychol. 86, 499–512. https://doi.org/10.1037/0021-9010.86.3.499.

Ellenbecker, C.H., Boylan, L.N., Samia, L., 2006. What home healthcare nurses are saying about their jobs. Home Healthc. Nurse 24, 315–324. https://doi.org/10.1097/00004045-200605000-00010.

Federal Public Service, 2019. Key data: general hospitals [WWW document]. URL https://www.healthybelgium.be/en/key-data-in-healthcare/general-hospitals/download-the-full-report-in-pdf-here (accessed 5.5.23).

Federal Public Service, 2022. Key data: healthcare professionals [WWW document]. URL https://www.healthybelgium.be/en/key-data-in-healthcare/healthcare-professionals/download-the-full-report-in-pdf-here (accessed 5.5.23).

Fernet, C., Guay, F., Senécal, C., 2004. Adjusting to job demands: the role of work self-determination and job control in predicting burnout. J. Vocat. Behav. 65, 39–56. https://doi.org/10.1016/S0001-8791(03)00098-8.

Fernet, C., Guay, F., Senécal, C., Austin, S., 2012. Predicting intraindividual changes in teacher burnout: the role of perceived school environment and motivational factors. Teach. Teach. Educ. 28, 514–525. https://doi.org/10.1016/j.tate.2011.11.013.

Fernet, C., Trépanier, S.G., Austin, S., Gagné, M., Forest, J., 2015. Transformational leadership and optimal functioning at work: on the mediating role of employees' perceived job characteristics and motivation. Work Stress. 29, 11–31. https://doi.org/10.1080/02678373.2014.1003998.

Fisher, G.G., Matthews, R.A., Gibbons, A.M., 2016. Developing and investigating the use of single-item measures in organizational research. J. Occup. Health Psychol. 21, 3–23. https://doi.org/10.1037/a0039139.
Gordon, H.J., Demerouti, E., Le Blanc, P.M., Bakker, A.B., Bipp, T., Verhagen, M.A.M.T., 2018. Individual job redesign: job crafting interventions in healthcare. J. Vocat. Behav. 104, 98–114. https://doi.org/10.1016/j.jvb.2017.07.002.
Hadžibajramović, E., Schaufeli, W., De Witte, H., 2022. Shortening of the Burnout Assessment Tool (BAT)—from 23 to 12 items using content and Rasch analysis. BMC Public Health 22, 1–16. https://doi.org/10.1186/s12889-022-12946-y.
Hakanen, J.J., Bakker, A.B., Schaufeli, W.B., 2006. Burnout and work engagement among teachers. J. Sch. Psychol. 43 (6), 495–513. https://doi.org/10.1016/j.jsp.2005.11.001.
Häusser, J.A., Mojzisch, A., Niesel, M., Schulz-Hardt, S., 2010. Ten years on: a review of recent research on the job demand-control (-support) model and psychological well-being. Work Stress. 24, 1–35. https://doi.org/10.1080/02678371003683747.
Hobfoll, S.E., Johnson, R.J., Ennis, N., Jackson, A.P., 2003. Resource loss, resource gain, and emotional outcomes among Inner City women. J. Pers. Soc. Psychol. 84, 632–643. https://doi.org/10.1037/0022-3514.84.3.632.
Houkes, I., Janssen, P.P.M., de Jonge, J., Nijhuis, F.J.N., 2001. Specific relationships between work characteristics and intrinsic work motivation, burnout and turnover intention: a multi-sample analysis. Eur. J. Work Organ. Psychol. 10, 1–23. https://doi.org/10.1080/13594320042000007.
Hu, L.T., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct. Equ. Model. 6, 1–55. https://doi.org/10.1080/10705519909540118.
Hu, Q., Schaufeli, W.B., Taris, T.W., 2011. The job demands-resources model: an analysis of additive and joint effects of demands and resources. J. Vocat. Behav. 79, 181–190. https://doi.org/10.1016/j.jvb.2010.12.009.
Humphrey, S.E., Nahrgang, J.D., Morgeson, F.P., 2007. Integrating motivational, social, and contextual work design features: a meta-analytic summary and theoretical extension of the work design literature. J. Appl. Psychol. 92, 1332–1356. https://doi.org/10.1037/0021-9010.92.5.1332.
Janssen, P.P.M., De Jonge, J., Bakker, A.B., 1999. Specific determinants of intrinsic work motivation, burnout and turnover intentions: a study among nurses. J. Adv. Nurs. 29, 1360–1369. https://doi.org/10.1046/j.1365-2648.1999.01022.x.
Jourdain, G., Chênevert, D., 2010. Job demands-resources, burnout and intention to leave the nursing profession: a questionnaire survey. Int. J. Nurs. Stud. 47, 709–722. https://doi.org/10.1016/j.ijnurstu.2009.11.007.
Kanfer, R., Frese, M., Johnson, R.E., 2017. Motivation related to work: a century of progress. J. Appl. Psychol. 102, 338–355. https://doi.org/10.1037/apl0000133.
Karasek, R., 1979. Job demands, job decision latitude, and mental strain: implications for job redesign. Adm. Sci. Q. 24, 285. https://doi.org/10.2307/2392498.
Karasek, R., Theorell, T., 1990. Healthy Work: Stress, Productivity and the Reconstruction of Working Life. Basic Books, New York.
Keyko, K., Cummings, G.G., Yonge, O., Wong, C.A., 2016. Work engagement in professional nursing practice: a systematic review. Int. J. Nurs. Stud. 61, 142–164. https://doi.org/10.1016/j.ijnurstu.2016.06.003.
Kim, M., Beehr, T.A., 2018. Challenge and hindrance demands lead to employees' health and behaviours through intrinsic motivation. Stress. Health 34, 367–378. https://doi.org/10.1002/smi.2796.
Kinman, G., Leggetter, S., 2016. Emotional labour and wellbeing: what protects nurses? Healthc. 4. https://doi.org/10.3390/healthcare4040089.
Klein, A., Moosbrugger, H., 2000. Maximum likelihood estimation of latent interaction effects with the LMS method. Psychometrika 65, 457–474. https://doi.org/10.1007/BF02296338.
Kutney-Lee, A., Wu, E.S., Sloane, D.M., Aiken, L.H., 2013. Changes in hospital nurse work environments and nurse job outcomes: an analysis of panel data. Int. J. Nurs. Stud. 50, 195–201. https://doi.org/10.1016/j.ijnurstu.2012.07.014.
Lee, J.S.Y., Akhtar, S., 2011. Effects of the workplace social context and job content on nurse burnout. Hum. Resour. Manag. 50, 227–245. https://doi.org/10.1002/hrm.20421.
LePine, J.A., Podsakoff, N.P., LePine, M.A., 2005. A meta-analytic test of the challenge stressor-hindrance stressor framework: an explanation for inconsistent relationships among stressors and performance. Acad. Manag. J. 48, 764–775. https://doi.org/10.5465/AMJ.2005.18803921.
Lesener, T., Gusy, B., Wolter, C., 2019. The job demands-resources model: a meta-analytic review of longitudinal studies. Work Stress. 33, 76–103. https://doi.org/10.1080/02678373.2018.1529065.
Llorens, S., Schaufeli, W., Bakker, A., Salanova, M., 2007. Does a positive gain spiral of resources, efficacy beliefs and engagement exist? Comput. Hum. Behav. 23, 825–841. https://doi.org/10.1016/j.chb.2004.11.012.
Montgomery, A., Spânu, F., Bəban, A., Panagopoulou, E., 2015. Job demands, burnout, and engagement among nurses: a multi-level analysis of ORCAB data investigating the moderating effect of teamwork. Burn. Res. 2, 71–79. https://doi.org/10.1016/j.burn.2015.06.001.
Muthén, L.K., Muthén, B., 2017. Mplus User's Guide: Statistical Analysis With Latent Variables, User's Guide. Muthén & Muthén, Los Angeles, CA.
van Oortmerssen, L.A., Caniëls, M.C.J., van Assen, M.F., 2020. Coping with work stressors and paving the way for flow: challenge and hindrance demands, humor, and cynicism. J. Happiness Stud. 21, 2257–2277. https://doi.org/10.1007/s10902-019-00177-9.
Parker, S.K., Sprigg, C.A., 1999. Minimizing strain and maximizing learning: the role of job demands, job control, and proactive personality. J. Appl. Psychol. 84, 925–939. https://doi.org/10.1037/0021-9010.84.6.925.
Podsakoff, N.P., Lepine, J.A., Lepine, M.A., 2007. Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: a meta-analysis. J. Appl. Psychol. 92, 438–454. https://doi.org/10.1037/0021-9010.92.2.438.
Ryan, R.M., Deci, E.L., 2000a. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am. Psychol. 55, 68–78. https://doi.org/10.1037/0003-066X.55.1.68.
Ryan, R.M., Deci, E.L., 2000b. Intrinsic and extrinsic motivations: classic definitions and new directions. Contemp. Educ. Psychol. 25, 54–67. https://doi.org/10.1006/ceps.1999.1020.
Ryan, R.M., Deci, E.L., 2020. Intrinsic and extrinsic motivation from a self-determination theory perspective: definitions, theory, practices, and future directions. Contemp. Educ. Psychol. 61. https://doi.org/10.1016/j.cedpsych.2020.101860.
Schaufeli, W.B., Bakker, A.B., 2004. Job demands, job resources, and their relationship with burnout and engagement: a multi-sample study. J. Organ. Behav. 25, 293–315. https://doi.org/10.1002/job.248.
Schaufeli, W.B., Taris, T.W., 2014. A critical review of the job demands-resources model: implications for improving work and health. Bridging Occupational, Organizational and Public Health: A Transdisciplinary Approach. Springer, pp. 43–68 https://doi.org/10.1007/978-94-007-5640-3_4.
Schaufeli, W., Salanova, M., González-romá, V., Bakker, A., 2002. The measurement of engagement and burnout: a two sample confirmatory factor analytic approach. J. Happiness Stud. 3, 71–92. https://doi.org/10.1023/A:1015630930326.
Schaufeli, W.B., Shimazu, A., Hakanen, J., Salanova, M., De Witte, H., 2019. An ultra-short measure for work engagement: the UWES-3 validation across five countries. Eur. J. Psychol. Assess. 35, 577–591. https://doi.org/10.1027/1015-5759/a000430.
Schaufeli, W.B., Desart, S., De Witte, H., 2020. Burnout assessment tool (bat)—development, validity, and reliability. Int. J. Environ. Res. Public Health 17, 1–21. https://doi.org/10.3390/ijerph17249495.
van de Schoot, R., Lugtig, P., Hox, J., 2012. A checklist for testing measurement invariance. Eur. J. Dev. Psychol. 9, 486–492. https://doi.org/10.1080/17405629.2012.686740.
Sermeus, W., Aiken, L.H., Ball, J., Bridges, J., Bruyneel, L., Busse, R., De Witte, H., Dello, S., Drennan, J., Eriksson, L.E., 2022. A workplace organisational intervention to improve hospital nurses' and physicians' mental health: study protocol for the Magnet 4Europe wait list cluster randomised controlled trial. BMJ Open 12, e059159. https://doi.org/10.1136/bmjopen-2021-059159.
Sonnentag, S., Frese, M., 2012. Stress in organizations. In: Weiner, I.B. (Ed.), Handbook of Psychology. Wiley, Hoboken, NY, pp. 560–592.
Stimpfel, A.W., Sloane, D.M., Aiken, L.H., 2012. The longer the shifts for hospital nurses, the higher the levels of burnout and patient dissatisfaction. Health Aff. 31, 2501–2509. https://doi.org/10.1377/hlthaff.2011.1377.
Stride, C.B., Gardner, S.E., Catley, N., Thomas, F., 2017. Mplus Code for Mediation, Moderation and Moderated Mediation Models (1 to 80).
Sundin, L., Hochwälder, J., Lisspers, J., 2011. A longitudinal examination of generic and occupational specific job demands, and work-related social support associated with burnout among nurses in Sweden. Work 38, 389–400. https://doi.org/10.3233/WOR-2011-1142.
Taris, T.W., Kompier, M.A.J.J., De Lange, A.H., Schaufeli, W.B., Schreurs, P.J.G.G., 2003. Learning new behaviour patterns: a longitudinal test of Karasek's active learning hypothesis among Dutch teachers. Work Stress. 17, 1–20. https://doi.org/10.1080/0267837031000108149.
Teoh, K., Dhensa-Kahlon, R., Christensen, M., Frost, F., Hatton, E., Nielsen, K., 2023. Organisational Wellbeing Interventions: Case Studies From the NHS.
Toode, K., Routasalo, P., Suominen, T., 2011. Work motivation of nurses: a literature review. Int. J. Nurs. Stud. 48, 246–257. https://doi.org/10.1016/j.ijnurstu.2010.09.013.
Toode, K., Routasalo, P., Helminen, M., Suominen, T., 2015. Hospital nurses' working conditions in relation to motivation and patient safety. Nurs. Manag. 21, 31–41. https://doi.org/10.7748/nm.21.10.31.e1293.
Tourangeau, A.E., Patterson, E., Saari, M., Thomson, H., Cranley, L., 2017. Work-related factors influencing home care nurse intent to remain employed. Health Care Manag. Rev. 42, 87–97. https://doi.org/10.1097/HMR.0000000000000093.
Tremblay, M.A., Blanchard, C.M., Taylor, S., Pelletier, L.G., Villeneuve, M., 2009. Work extrinsic and intrinsic motivation scale: its value for organizational psychology research. Can. J. Behav. Sci. 41, 213–226. https://doi.org/10.1037/a0015167.
Trépanier, S.G., Forest, J., Fernet, C., Austin, S., 2015. On the psychological and motivational processes linking job characteristics to employee functioning: insights from self-determination theory. Work Stress. 29, 286–305. https://doi.org/10.1080/02678373.2015.1074957.
Tummers, G.E.R., Landeweerd, J.A., Van Merode, G.G., 2002. Work organization, work characteristics, and their psychological effects on nurses in The Netherlands. Int. J. Stress. Manag. 9, 183–206. https://doi.org/10.1023/A:1015519815319.
Van Beek, I., Hu, Q., Schaufeli, W.B., Taris, T.W., Schreurs, B.H.J., 2012. For fun, love, or money: what drives workaholic, engaged, and burned-out employees at work? Appl. Psychol. 61, 30–55. https://doi.org/10.1111/j.1464-0597.2011.00454.x.
Van den Broeck, A., Vansteenkiste, M., De Witte, H., Lens, W., 2008. Explaining the relationships between job characteristics, burnout, and engagement: the role of basic psychological need satisfaction. Work Stress. 22, 277–294. https://doi.org/10.1080/02678370802393672.
Van den Broeck, A., De Cuyper, N., De Witte, H., Vansteenkiste, M., 2010. Not all job demands are equal: differentiating job hindrances and job challenges in the job demands-resources model. Eur. J. Work Organ. Psychol. 19, 735–759. https://doi.org/10.1080/13594320903223839.
Van den Broeck, A., Howard, J.L., Van Vaerenbergh, Y., Leroy, H., Gagné, M., 2021. Beyond intrinsic and extrinsic motivation: a meta-analysis on self-determination theory's multidimensional conceptualization of work motivation. Organ. Psychol. Rev. 11, 240–273. https://doi.org/10.1177/20413866211006173.
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. https://doi.org/10.1080/026783799296084.

Van Veldhoven, M., Van den Broeck, A., Daniels, K., Bakker, A.B., Tavares, S.M., Ogbonnaya, C., 2020. Challenging the universality of job resources: why, when, and for whom are they beneficial? Appl. Psychol. 69, 5–29. https://doi.org/10.1111/apps.12211.

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. Acad. Manag. J. 46, 339–348. https://doi.org/10.2307/30040627.

Van Yperen, N.W., Wörtler, B., De Jonge, K.M.M., 2016. Workers' intrinsic work motivation when job demands are high: the role of need for autonomy and perceived opportunity for blended working. Comput. Hum. Behav. 60, 179–184. https://doi.org/10.1016/j.chb.2016.02.068.

Vander Elst, T., Cavents, C., Daneels, K., Johannik, K., Baillien, E., Van den Broeck, A., Godderis, L., 2016. Job demands–resources predicting burnout and work engagement among Belgian home health care nurses: a cross-sectional study. Nurs. Outlook 64, 542–556. https://doi.org/10.1016/j.outlook.2016.06.004.

Vangrieken, K., De Cuyper, N., De Witte, H., 2022. Karasek's activation hypothesis: a longitudinal test of within-person relationships. J. Organ. Behav. https://doi.org/10.1002/job.2669.

Weibel, A., Rost, K., Osterloh, M., 2007. Crowding-out of Intrinsic Motivation-opening the Black Box (Available SSRN 957770).

Xanthopoulou, D., Bakker, A.B., Dollard, M.F., Demerouti, E., Schaufeli, W.B., Taris, T.W., Schreurs, P.J.G., 2007. When do job demands particularly predict burnout? The moderating role of job resources. J. Manag. Psychol. 22, 766–786. https://doi.org/10.1108/02683940710837714.

Xanthopoulou, D., Bakker, A.B., Demerouti, E., Schaufeli, W.B., 2009. Work engagement and financial returns: a diary study on the role of job and personal resources. J. Occup. Organ. Psychol. 82, 183–200. https://doi.org/10.1348/096317908X285633.

Xu, X., Payne, S.C., 2020. When do job resources buffer the effect of job demands? Int. J. Stress. Manag. 27, 226–240. https://doi.org/10.1037/str0000146.