

The Job Demands-Resources model: A three-year cross-lagged study of burnout, depression, commitment, and work engagement

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By using a full panel design in a representative sample of Finnish dentists ($N = 2555$), the present study aimed to test longitudinally the motivational and health impairment processes as proposed in the Job Demands-Resources (JD-R) model. The second aim was to investigate whether home resources and home demands have an additional influence on both processes over time. The hypotheses were tested with cross-lagged analyses based on two waves over a 3-year period. The results supported both the motivational process and the health impairment process. Job resources influenced future work engagement, which, in turn, predicted organizational commitment, whereas job demands predicted burnout over time, which, in turn, predicted future depression. In addition, job resources had a weak negative impact on burnout. Home demands and home resources did not influence the motivational or health impairment process over time. The results support the central role of work characteristics for health and well-being. By integrating both human thriving and ill-health in the same model, the JD-R model may help to bridge the gap between “negative” and “positive” psychology.

Keywords: Job Demands-Resources model; work engagement; burnout; well-being; depression; organizational commitment; cross-lagged panel analysis; positive psychology; dentists

Introduction

The Job Demands-Resources (JD-R) model is a comprehensive attempt at explaining simultaneously the well-being and ill-health of employees, and the related antecedents and consequences (Schaufeli & Bakker, 2004). So far, the complete model has been tested almost exclusively cross-sectionally. The present two-wave study with a 3-year follow-up among 2555 Finnish dentists tested the JD-R model with a cross-lagged panel design using work engagement and burnout as mediators and organizational commitment and depression as major outcomes. In addition, we examined whether home resources and home demands would have additional impacts on the motivational and health impairment processes assumed in the model.

The JD-R model

The starting point of the JD-R model is the assumption that regardless of the type of job, the psychosocial work characteristics can be categorized into two groups: job resources and job

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demands (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Schaufeli & Bakker, 2004). *Job resources* refer to the physical, psychological, social, or organizational aspects of a job that (1) may reduce job demands and the associated physiological and psychological costs, (2) are functional in achieving work goals, and (3) stimulate personal growth, learning, and development. Hence, job resources may foster extrinsic motivation at work because they are necessary to deal with job demands and to achieve work goals. In addition, by satisfying the basic psychological needs of autonomy, belongingness and competence, job resources are also intrinsically motivating for employees (Van den Broeck, Vansteenkiste, De Witte, & Lens, 2008). *Job demands* refer to those aspects of a job that require sustained physical and/or psychological effort and are therefore associated with certain physiological and/or psychological costs.

As triggers of the motivational process, job resources are assumed to increase work engagement which, in turn, is associated with positive outcomes such as, for example, organizational commitment (Schaufeli & Bakker, 2004). *Work engagement* is defined as a positive, fulfilling, work-related state of mind that is characterized by vigour, dedication, and absorption (Bakker, Schaufeli, Leiter, & Taris, 2008; Schaufeli, Salanova, González-Roma, & Bakker, 2002). Vigour is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence in the face of difficulties. Dedication is characterized by a sense of significance, enthusiasm, inspiration, pride, and challenge. The third defining characteristic of engagement is absorption, which is characterized by being fully concentrated and happily engrossed in one's work, a sense that time passes quickly, and difficulty in detaching oneself from work. Recent research suggests, however, that vigour and dedication constitute the core dimensions of engagement (e.g., Gonzalez-Roma, Schaufeli, Bakker, & Lloret, 2006).

The health impairment process can be characterized as an energy draining process which is mediated by burnout (Schaufeli & Bakker, 2004). *Burnout* has been defined as a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment that can occur among individuals who work with people (Maslach & Jackson, 1986, p. 1). *Emotional exhaustion* denotes a lack of energy and a sense of emotional resources being consumed fully by work (Maslach & Jackson, 1986). The second dimension, *depersonalization*, signifies an unfeeling, or cynical, and impersonal response toward the recipients of one's services. The third dimension, *reduced personal accomplishment*, is marked by a tendency to evaluate oneself negatively, particularly with regard to work with clients. However, evidence has accumulated that the core of burnout syndrome consists of emotional exhaustion and depersonalization, whereas reduced personal accomplishment seems to develop largely independently of exhaustion and depersonalization (e.g., Schaufeli & Taris, 2005).

Both the motivational and health impairment processes have empirical support. The amount of job resources has been found to relate to the level of work engagement (Bakker, Hakanen, Demerouti, & Xanthopoulou, 2007; Hakanen, Bakker, & Demerouti, 2005; Mauno, Kinnunen, & Ruokolainen, 2007). Furthermore, there is evidence of a mediating role of work engagement between job resources and positive motivational outcomes, indicated by low turnover intention (Schaufeli & Bakker, 2004), organizational commitment (Hakanen, Bakker, & Schaufeli, 2006; Llorens, Bakker, Schaufeli, & Salanova, 2006), and personal initiative and work-unit innovativeness (Hakanen, Perhoniemi, & Toppinen-Tanner, 2008). However, longitudinal support for the motivational process is still scanty. In addition, job demands may also play an indirect role in the motivational process, as burnout has also been related negatively to organizational commitment (Hakanen et al., 2006; Lee & Ashforth, 1996; Schaufeli & Bakker, 2004; Schaufeli & Enzmann, 1998, pp. 89–91).

There is also plenty of evidence indicating an association between high job demands or lack of resources and level of burnout (see for reviews, Halbesleben & Buckley, 2004; Lee & Ashforth, 1996; Schaufeli & Enzmann, 1998) although the relationship has typically been weaker concerning job resources compared to job demands. In addition, there is growing evidence supporting the positive association between burnout and ill-health (Ahola et al., 2005; Shirom, Melamed, Toker, Berliner, & Shapira, 2005; Toppinen-Tanner, Ojajarvi, Väänänen, Kalimo, & Jäppinen, 2005). Furthermore, there is direct support for the health impairment process from studies that have tested the mediated process from job demands via burnout to various indicators of ill-health (Ahola & Hakanen, 2007; Bakker, Demerouti, de Boer, & Schaufeli, 2003; Hakanen et al., 2006; Schaufeli & Bakker, 2004). However, longitudinal support for this process of health impairment remains sparse, and depression or other indicators of mental health have rarely been included as an outcome. In addition, the causal relationship between burnout and depression has remained unresolved (see for reviews, Glass & McKnight, 1996; Schaufeli & Enzmann, 1998, pp. 39–40).

Is the Job Demands-Resources model affected by home demands and home resources?

One potential limitation of the JD-R model is that it focuses solely on the psychosocial work environment as the antecedent of health-related and motivational outcomes and dismisses the factors not related to work. Epidemiological research has found evidence that both work and home factors may affect employee well-being and health (Chandola, Kuper, Singh-Manoux, Bartley, & Marmot, 2004; Melchior, Berkman, Niedhammer, Zins, & Goldberg, 2007). To our knowledge, the study by Bakker, Demerouti, and Schaufeli (2005) is the only work that has systematically combined home demands and home resources with the JD-R model. Interestingly, they found that home characteristics were associated with work-related states (work engagement and burnout), although to a lesser extent than job demands and job resources. More specifically, they found that, regardless of the work situation, home demands were related positively to exhaustion between both genders and to cynicism among men, whereas home resources were associated with work engagement in both men and women. In addition, emotional home demands were negatively associated with experiences of work engagement among women.

The present study

The theoretical model to test the hypothesized motivational and health impairment processes used in the present study is shown in Figure 1. In the first part of the study, we tested longitudinally the JD-R model proposed by Schaufeli and Bakker (2004). Based on the assumptions of the JD-R model and previous cross-sectional studies, we formulated the following hypotheses concerning the motivational process:

Hypothesis 1a: Job resources will have a positive cross-lagged impact on work engagement.

Hypothesis 1b: Work engagement will have a positive cross-lagged impact on organizational commitment.

Hypothesis 1c: Burnout will have a negative cross-lagged impact on organizational commitment.

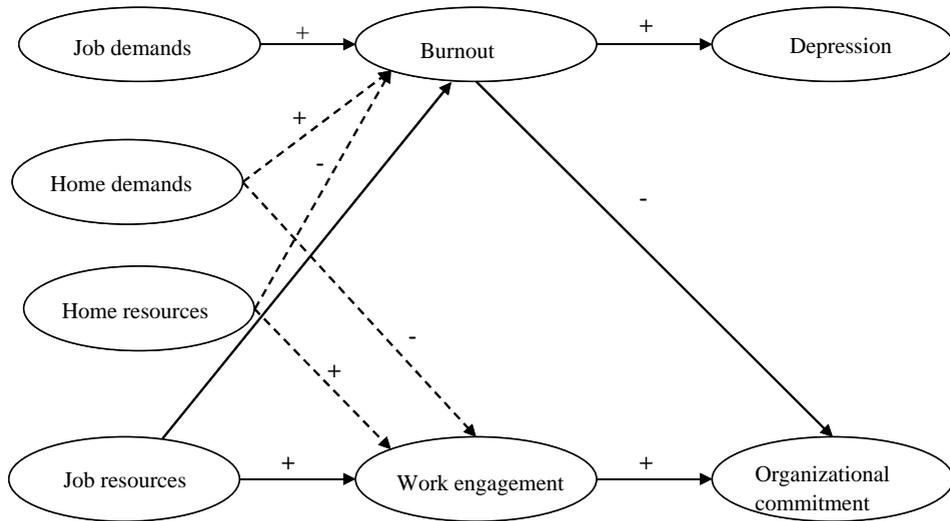


Figure 1. Theoretical model.

For the health impairment process, we hypothesized:

Hypothesis 2a: Job demands will have a positive cross-lagged impact on burnout.

Hypothesis 2b: Burnout will have a positive cross-lagged impact on depression.

Hypothesis 2c: Job resources will have a negative cross-lagged impact on burnout.

In the second part of the study, we used a rigorous longitudinal test to investigate whether home characteristics have an additional effect on motivational and health impairment processes, after controlling for the impact of job demands and job resources. In accordance with tentative evidence from previous studies, we hypothesized that:

Hypothesis 3a: Home resources will have a negative cross-lagged impact on burnout and a positive cross-lagged impact on work engagement.

Hypothesis 3b: Home demands will have a positive cross-lagged impact on burnout and a negative cross-lagged impact on work engagement.

Although we hypothesized that we would find causal paths in the study models, we also tested potential reversed and reciprocal cross-lagged relationships between the study variables. In a review on longitudinal studies on organizational stress, Zapf, Dormann, and Frese (1996) found at least some indications for reverse causal effects in approximately half of the studies testing reversed relationships. For instance, it could be that job demands lead to burnout, while those with high levels of burnout may also perceive higher job demands, either because of a negatively biased perception or because of actual changes in the work environment (de Lange, Taris, Kompier, Houtman, & Bongers, 2004).

Methods

Participants

This study was part of a longitudinal research project that focused on psychosocial working conditions, the work–family interface, well-being, and health in dentistry. At baseline, a questionnaire survey was sent to all dentist members of the Finnish Dental Association (FDA) ($N = 4588$). Altogether, 3255 (71%) dentists responded to the questionnaire at baseline (T1). A total of 2555 of those identified three years later ($N = 3035$) took part in the follow-up (T2) (84%). The respondents were representative of all Finnish dentists in terms of age and gender (Hakanen et al., 2005). The participants of the follow-up study still accounted for approximately 57% of the dental profession in Finland. Dropout analyses revealed no significant differences at baseline among any of the study variables between those who dropped out and those who did not.

Measures

The three *job resources* included in this study were derived from the Dentists' Experienced Job Resources Scale (DEJRS; Gorter, te Brake, Eijkman, & Hoogstraten, 2006), which is specifically aimed at identifying and investigating job resources in dentistry. DEJRS is validated among large samples of dentists in the Netherlands (Gorter et al., 2006) and in Finland (Hakanen, 2004a). *Craftsmanship* ($\alpha_{T1} = .71$, $\alpha_{T2} = .72$) consisted of three items (e.g., “the possibility to work with one’s hands”). *Professional contacts* ($\alpha_{T1} = .75$, $\alpha_{T2} = .78$) included four items, such as “interacting with colleagues.” *Long-term and immediate results* ($\alpha_{T1} = .87$, $\alpha_{T2} = .89$) comprised six items (e.g., “seeing the good results of treatment”). All DEJRS items were scored from 1 = “very little or not at all” to 5 = “very much.” Hence, these measures capture aspects of task variety, social support at work, and feedback in dentistry, respectively.

We included three *job demands* that are known to be sources of strain among dentists (Gorter, Albrecht, Hoogstraten, & Eijkman, 1999; Hakanen et al., 2005). *Quantitative workload* ($\alpha_{T1} = .78$, $\alpha_{T2} = .79$) was assessed with three items from Karasek’s (1985) Job Content Instrument. The items were scored from 1 (“strongly agree”) to 5 (“strongly disagree”) and reversed so that high scores were indicative of high workload. In *Work contents* ($\alpha_{T1} = .84$, $\alpha_{T2} = .86$) from the Dentists' Experienced Work Stressors Scales (DEWSS) by Gorter and his colleagues (1999), respondents were requested to indicate the stressfulness (1 = “very little,” 5 = “very much”) of six scenarios (e.g., “inflicting pain”). *Physical work environment* (Hakanen et al., 2005; $\alpha_{T1} = .79$, $\alpha_{T2} = .81$) consists of eight items on perceived problems in the physical work environment (e.g., “noise”; 1 = “not at all,” 5 = “very much”).

Home resources were assessed with two scales and a single item. *Family/partner support* scale ($\alpha_{T1} = .86$, $\alpha_{T2} = .86$) consisted of four items adapted from Peeters and Le Blanc (2001; e.g., “My family/partner pays attention to my feelings and problems”). *Support from friends* was assessed with one item (“I get support from my friends when needed”). *Positive spillover from family to work* ($\alpha_{T1} = .72$, $\alpha_{T2} = .72$) was assessed with three items (“My home life helps me relax and feel ready for the next day’s work”) adapted from Grzywacz and Marks (2000). All items were rated on a 5-point scale ranging from “never” to “always.”

Home demands were measured with three scales. *Quantitative home demands* (Montgomery, Peeters, Schaufeli, & den Ouden, 2003) included four items (e.g., “Are you normally busy at home?”; $\alpha_{T1} = .76$, $\alpha_{T2} = .76$). *Emotional home demands* (Montgomery et al., 2003) consisted of five items (“How often do emotional issues arise at home?”; $\alpha_{T1} = .83$, $\alpha_{T2} = .85$). *Negative*

spillover from family to work ($\alpha_{T1}=.79$, $\alpha_{T2}=.80$) was assessed with four items (e.g., “Responsibilities at home reduce the effort I can devote to my job”) adapted from Grzywacz and Marks (2000). All items were rated on a 5-point scale from “never” to “all the time.”

Work engagement was assessed with two scales of the Finnish version of the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2002). *Vigour* was assessed with six items ($\alpha_{T1}=.77$, $\alpha_{T2}=.75$) and *dedication* with five ($\alpha_{T1}=.87$, $\alpha_{T2}=.86$). Items of work engagement were rated on a seven-point scale ranging from 0 (“never”) to 6 (“always”).

Burnout was measured with two scales from the Maslach Burnout Inventory (MBI; Maslach & Jackson, 1981): *emotional exhaustion* (9 items; $\alpha_{T1}=.91$, $\alpha_{T2}=.91$) and *depersonalization* (5 items; $\alpha_{T1}=.73$, $\alpha_{T2}=.77$). The items were scored on a 7-point frequency rating scale ranging from 0 (“never”) to 6 (“daily”).

Organizational commitment was measured with two items from the Healthy Organization Barometer (HOB), a well-validated questionnaire in Finnish organizational studies (Lindström, Hottinen, & Bredenberg, 2000; Hakanen et al., 2006). The items assessed on a 5-point scale (1 = “totally disagree,” 5 = “totally agree”) were “I’m willing to put serious effort into furthering the basic mission of my organization” and “I feel that the aims and objectives of my workplace are important” ($\alpha_{T1}=.82$, $\alpha_{T2}=.83$).

Depression was measured with the short form of the Beck Depression Inventory (BDI; Beck & Beck, 1972) which consists of 13 items with four alternatives for intensity; higher scores indicate more severe depressive symptoms. After examining the factorial structure of the measure, we used two scales to indicate depression (Byrne, Baron, & Balev, 1996): *negative attitudes* (seven items covering such topics as sadness; $\alpha_{T1}=.79$, $\alpha_{T2}=.81$) and *performance difficulties and somatic elements* (six items like social withdrawal; $\alpha_{T1}=.72$, $\alpha_{T2}=.71$).

Statistical analyses

In order to investigate the cross-lagged longitudinal analyses, we employed structural equation modelling (SEM) techniques using the AMOS 6.0 software package. Several indicators for each latent variable were used in the tested models at both times. As a preliminary step in the analyses, we tested the measurement model that defines the relations between all observed and unobserved study variables. The measurement model (CFA) specifies the pattern by which each measure is loaded on a particular factor (Byrne, 2001, p. 12).

Next, in order to test the hypothesized structural model with two time waves we applied the approach suggested by Cole and Maxwell (2003) and Taris and Kompier (2006). To test mediation with two-wave designs, they recommend a pair of longitudinal tests that can detect partial mediation so that separate analyses are conducted for: (1) causal relationships between predictor(s) and mediator(s) and (2) causal relationships between mediator(s) and outcome(s). In our study, this procedure implied two pairs of cross-lagged tests for structural models: testing cross-lagged relationships between (1) job demands and job resources (and home demands and home resources in the extended model as predictors) and burnout and work engagement (mediators) and (2) between burnout and work engagement (mediators) and depression and organizational commitment (outcomes). Auto-regression effects were included in order to control for baseline levels for each endogenous variable, as suggested by Gollob and Reichard (1991, pp. 243–259). In addition, synchronous correlations between the latent variables were allowed in all tested models. Moreover, the error terms of each indicator at T1 were allowed to covary with the corresponding indicator at T2, as is usual in longitudinal structural equation models. We tested several competing structural models using

full panel designs to investigate the proposed cross-lagged effects: (1) *the stability model* (M_{stabil}), which included the autoregressive effects over time of each latent variable but did not include any cross-lagged associations; (2) *the causality model* (M_{causal}), which included the autoregressive effects as in M_{stabil} combined with the causal relationships as hypothesized in the JD-R model; (3) *the reversed causation model* (M_{revers}), which included the autoregressive effects as in M_{stabil} combined with the reversed effects of the paths in the JD-R model; and (4) *the reciprocal model* (M_{recipr}) which is a combination of M_{causal} and M_{revers} . Exploratory factor analyses showed that the items measuring job resources and organizational commitment loaded on their expected factors and did not overlap with work engagement items.

Results

Descriptive statistics

The pattern of correlations was as expected. Job demands correlated positively with burnout and depression both synchronously and over time, and negatively albeit more modestly with work engagement and organizational commitment. In contrast, job resources correlated both synchronously and over time more strongly with work engagement and organizational commitment than with burnout and depression. In addition, the dimensions of work engagement and depression correlated negatively. Moreover, the dimensions of burnout and work engagement, i.e., the mediators of the present study, were rather stable, since their autocorrelations varied between .64 and .71. (The correlation table can be obtained from the first author on request.)

Longitudinal testing of the Job Demands-Resources model

Table 1 shows that the measurement model (M_{m1}) presented a good fit to the data. Next, a direct effects model (M_{dir1}) without burnout and work engagement as mediators showed a good fit to the data (Table 1). The model showed that job demands had a direct cross-lagged effect on depression ($\beta = .24, p < .001$), whereas job resources were directly associated with organizational commitment over time ($\beta = .21, p < .001$).

As can be seen in Table 1, the causal model ($M1_{\text{causal}}$) with the cross-lagged associations between T1 job demands and job resources and T2 burnout and work engagement provided a better fit to the data than the stability model without cross-lagged associations ($M1_{\text{stabil}}$; $\Delta\chi^2 = 21.42, \Delta df = 4, p < .001$), whereas the reversed causation model ($M1_{\text{revers}}$) did *not* improve the model fit compared with $M1_{\text{stabil}}$ ($\Delta\chi^2 = 7.89, \Delta df = 2, \text{n.s.}$). Also, the reciprocal model ($M1_{\text{recipr}}$) did not improve the model fit compared with $M1_{\text{causal}}$ ($\Delta\chi^2 = 8.50, \Delta df = 4, \text{n.s.}$) which in terms of parsimony was thereby the best fitting model. In $M1_{\text{causal}}$ (see Figure 2) job demands at T1 had a longitudinal cross-lagged effect on burnout at T2 ($\beta = .23, p < .001$) as expected, whereas job resources at T1 had a positive longitudinal cross-lagged effect on future work engagement (β was .08, $p < .01$) and a negative effect on future burnout ($\beta = -.05, p < .05$), even after the autoregressive effects of the latent variables were controlled for. Contrary to expectations, job demands at T1 were negatively, albeit weakly, related to work engagement at T2 ($\beta = -.05, p < .05$).

Table 1 shows that again the causal model ($M2_{\text{causal}}$) with the cross-lagged associations between T1 burnout and work engagement and T2 depression and organizational commitment presented a better fit to the data than the stability model ($M2_{\text{stabil}}$; $\Delta\chi^2 = 105.82, \Delta df = 4, p < .001$), whereas the reciprocal model ($M2_{\text{recipr}}$) had a better fit than $M2_{\text{stabil}}$

Table 1. Fit statistics for investigating the Job Demands-Resources model ($N=2555$).

<i>Model</i>	<i>Model description</i>	χ^2	<i>df</i>	<i>GFI</i>	<i>CFI</i>	<i>NFI</i>	<i>TLI</i>	<i>RMSEA</i>	<i>Model comparisons</i>	$\Delta\chi^2$	Δdf
M _{m1}	Measurement model	1390.94	270	0.96	0.97	0.96	0.96	0.043			
M _{dir1}	Direct effect of job demands and job resources on depression and organizational commitment	642.89	136	0.97	0.97	0.97	0.98	0.040			
<i>Cross-lagged relationships between job demands, job resources, burnout, and work engagement</i>											
M1 _{stabil}	Stability model	1049.36	144	0.95	0.96	0.96	0.95	0.053			
M1 _{causal}	Causality model (M _{stabil} + job demands and resources → burnout and work engagement)	1027.94	140	0.96	0.96	0.96	0.95	0.053	M1 _{stabil} vs. M1 _{causal}	21.42***	4
M1 _{revers}	Reversed causation model (M _{stabil} + burnout and work engagement → job demands and resources)	1041.47	140	0.95	0.96	0.96	0.95	0.053	M1 _{stabil} vs. M1 _{revers}	7.89 n.s.	4
M1 _{recipr}	Reciprocal model (M _{causal} + M _{reversed})	1019.44	136	0.96	0.96	0.96	0.95	0.053	M1 _{stabil} vs. M1 _{recipr}	29.92***	8
									M1 _{causal} vs. M1 _{recipr}	8.50 n.s.	4
									M1 _{revers} vs. M1 _{recipr}	22.03***	4
<i>Cross-lagged relationships between burnout, work engagement, depression, and organizational commitment</i>											
M2 _{stabil}	Stability model	357.62	80	0.98	0.99	0.98	0.98	0.039			
M2 _{causal}	Causality model (M _{stabil} + burnout and work engagement → depression and organizational commitment)	251.80	76	0.99	0.99	0.99	0.99	0.032	M2 _{stabil} vs. M2 _{causal}	105.82***	4
M2 _{revers}	Reversed causation model (M _{stabil} + depression and organizational commitment → burnout and engagement)	343.74	76	0.98	0.99	0.98	0.98	0.039	M2 _{stabil} vs. M2 _{revers}	13.88**	4
M2 _{recipr}	Reciprocal model (M _{causal} + M _{reversed})	243.58	72	0.99	0.99	0.99	0.99	0.032	M2 _{stabil} vs. M2 _{recipr}	114.04***	8
									M2 _{causal} vs. M2 _{recipr}	8.22 n.s.	4
									M2 _{revers} vs. M2 _{recipr}	100.16***	4

** $p < .01$; *** $p < .001$.

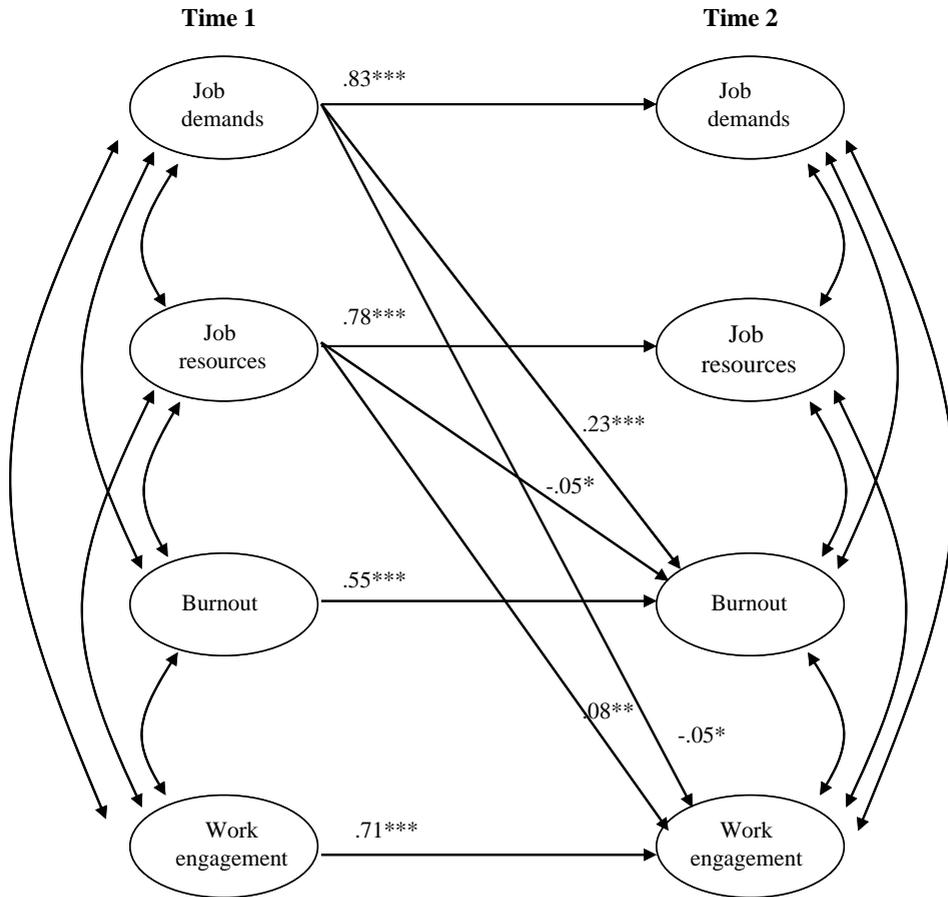


Figure 2. Cross-lagged relationships between job demands, job resources, burnout, and work engagement ($N=2555$). $\chi^2=1027.94$; $df=140$; $GFI=.96$; $CFI=.96$; $TLI=.95$; $NFI=.96$; $RMSEA=.053$.

($\Delta\chi^2 = 114.04$, $\Delta df = 8$, $p < .001$) or $M2_{revers}$ ($\Delta\chi^2 = 100.16$, $\Delta df = 4$, $p < .001$). Lastly, $M2_{recipr}$ did not have a significantly better fit than $M2_{causal}$ ($\Delta\chi^2 = 8.22$, $\Delta df = 4$, n.s.), suggesting that $M2_{causal}$ was the best fitting model, as expected. Accordingly, Figure 3 shows that, in addition to autoregressive effects, burnout had a positive cross-lagged effect on depression three years later ($\beta = .16$, $p < .001$) but not on organizational commitment ($\beta = -.03$, n.s.), whereas work engagement at T1 had a positive cross-lagged effect on future organizational commitment ($\beta = .23$, $p < .001$) but *not* on depression ($\beta = -.04$, n.s.).

To summarize, the two-phase cross-lagged panel analyses supported both (1) the expected mediated motivational process from job resources via work engagement to organizational commitment (hypotheses 1a and 1b), and (2) the expected mediated health impairment process leading from job demands through burnout to depression (hypotheses 2a and 2b) over a 3-year follow-up period. Moreover, job resources at baseline were negatively albeit weakly related to burnout over time (hypothesis 2c) and somewhat unexpectedly, job demands at baseline displayed a slight negative association with work engagement at T2, whereas contrary to hypothesis 1c burnout did *not* predict organizational commitment.

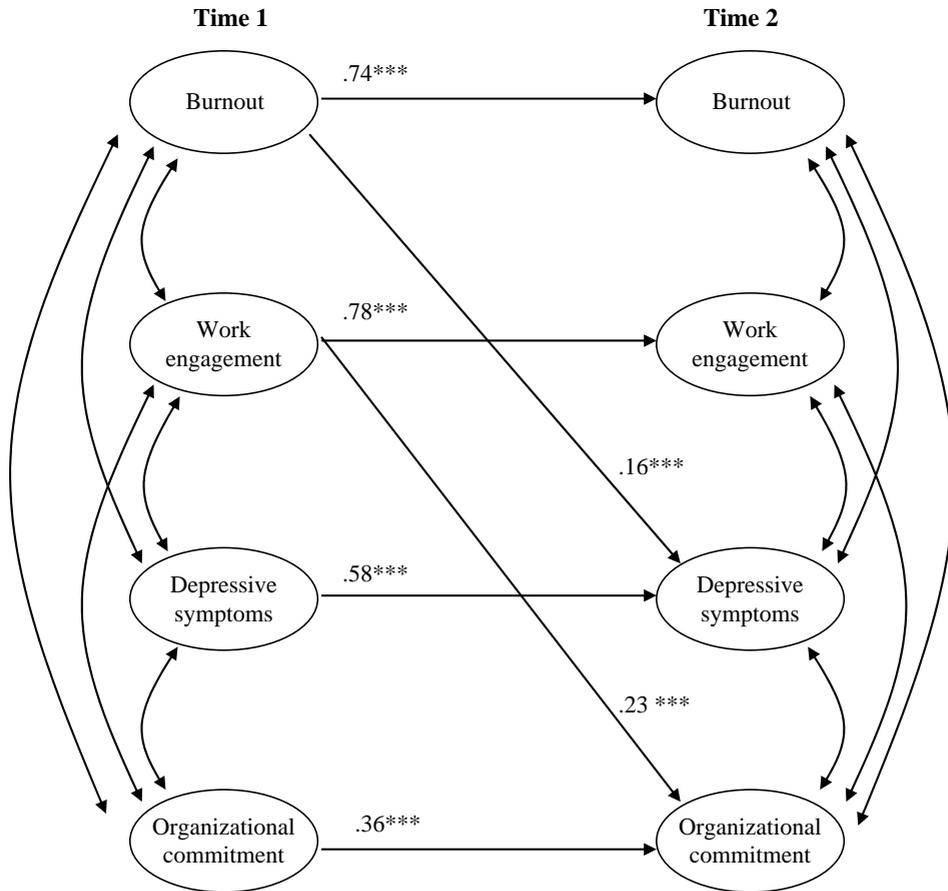


Figure 3. Cross-lagged relationships between burnout, work engagement, depression, and organizational commitment ($N = 2555$). $\chi^2 = 251.80$; $df = 76$; $GFI = .99$; $CFI = .99$; $TLI = .99$; $NFI = .99$; $RMSEA = .032$.

Adding home demands and home resources to the Job Demands-Resources model

Again, both the overall measurement model (M_{m2}) and the direct effects model (M_{dir2}) indicated a very good fit to the data (Table 2). Next, we investigated the cross-lagged relationships between the study variables by comparing alternative models. As a starting point we used the previous best fitting model, i.e., the causality model ($M1_{causal}$), in which both job resources and job demands predicted both work engagement and burnout. To this model we added home demands and home resources, but in the first model ($M3_{start}$) all their cross-lagged associations were set to zero to indicate a baseline model without any home-related lagged effects. In the second otherwise similar model to $M3_{start}$ ($M3_{causal}$) causal pathways from home demands and resources to work engagement and burnout were allowed whereas the third model ($M3_{revers}$) allowed (in addition to associations in $M3_{start}$) for reversed causal pathways from work engagement and burnout to home resources and home demands. Finally, the reciprocal model ($M3_{recipr}$) allowed (in addition to associations in $M3_{start}$) reciprocal cross-lagged effects between home resources and demands, and work engagement

Table 2. Fit statistics for investigating the Job Demands-Resources model including home demands and home resources ($N = 2555$).

<i>Model</i>	<i>Model description</i>	χ^2	<i>df</i>	<i>GFI</i>	<i>CFI</i>	<i>NFI</i>	<i>TLI</i>	<i>RMSEA</i>	<i>Model comparisons</i>	$\Delta\chi^2$	Δdf
M _{m2}	Measurement model	2532.01	600	.94	.96	.95	.95	.038			
M _{dir2}	Direct effect of job and home demands and resources on depression and organizational commitment	1742.88	404	.96	.96	.95	.96	.037			
M3 _{start}	The starting model (M1 _{causal}) in which home demands and resources are added but all their cross-lagged associations are set to zero	2046.20	408	.94	.96	.95	.95	.043			
M3 _{causal}	Home-related causality model (M _{start} + home demands and resources → burnout and work engagement)	2043.32	404	.94	.96	.95	.95	.043	M3 _{start} vs. M3 _{causal}	2.88 n.s.	4
M3 _{revers}	Home-related reversed causation model (M _{start} + burnout and work engagement → home demands and resources)	2037.42	404	.94	.96	.95	.95	.043	M3 _{start} vs M3 _{revers}	8.78 ^a	4
M3 _{recipr}	Home-related reciprocal model (M3 _{causal} + M3 _{revers})	2034.85	400	.94	.96	.95	.95	.043	M3 _{start} vs M3 _{recipr}	11.35 n.s.	8
									M3 _{causal} vs M3 _{recipr}	8.47 n.s.	4
									M3 _{revers} vs M3 _{recipr}	2.57 n.s.	4

^a $p = .067$.

and burnout. Thus, all models included the work-related cross-lagged effects found in $M1_{\text{causal}}$ as well as the synchronous correlations between the latent home- and work-related and well-being variables.

Table 2 shows that the alternative models to $M3_{\text{start}}$, in which home-related effects were constrained to zero, did not improve the model fit. In the best fitting model $M3_{\text{start}}$ the weak effect of job demands at T1 on work engagement at T2 disappeared, thus providing further support for the hypothesized dual processes. However, it is noteworthy that $M3_{\text{revers}}$ in which work engagement and burnout were expected to have cross-lagged impacts on home resources and demands fitted well to the data and included a significant cross-lagged effect of burnout at T1 on future home demands ($\beta = .07, p = .006$). Because this association was rather weak, it did not improve the model fit of $M3_{\text{start}}$ in a significant way ($\Delta\chi^2 = 8.78, \Delta df = 4, p = .067$). Home demands and home resources did *not* have an effect on the well-being factors (hypotheses 3a and 3b).

Discussion

This study aimed at longitudinal testing of the JD-R model and identifying the potential additive effects of home characteristics on well-being at work. By using a two-wave 3-year cross-lagged panel design in a large, representative sample of Finnish dentists, our results provided support to and new insight into the JD-R model in three ways. First, we found longitudinal support for the motivational and health impairment processes assumed in the JD-R model (Schaufeli & Bakker, 2004) after the baseline situation was controlled for. Second, this was the first study to show that the health impairment process may involve severe mental health problems, namely depression, as a long-term outcome, whereas dentists' level of depression did not predict their future burnout. Third, home demands and home resources did not have an additional impact on motivational or health impairment processes, suggesting that the two processes are work-related. On the contrary, our results suggested that the health impairment process may be extended to home conditions, because burnout was positively related to future home demands.

The dual process

The innovative aspect of the JD-R model is that it incorporates two kinds of work characteristics, labelled either as job resources or as job demands, in the same heuristic model triggering the dual process of motivation and ill-health (Schaufeli & Bakker, 2004). Our results support the idea of the work-related motivational process from job resources to engagement and again to organizational commitment taking place over time. The positive relationship between job resources and work engagement has been found in several cross-sectional studies (e.g., Bakker et al., 2007; Hakanen et al., 2006; Schaufeli & Bakker, 2004). According to the study by de Lange and her colleagues (2008), this relationship is at least partially mediated by basic need satisfaction. In contrast, Mauno and her colleagues (2007) found in their longitudinal study only tentative support for the predictive role of job resources on work engagement. After controlling for work engagement at baseline, only one of the nine relationships tested between job resources and dimensions of work engagement was statistically significant. In a similar vein, the positive association between work engagement and indicators of organizational commitment have previously only been found in cross-sectional studies (Hakanen et al., 2006; Llorens et al., 2006; Schaufeli & Bakker, 2004).

Because the effect of job resources on work engagement was the weakest association among the main processes of the JD-R model, we divided the sample into two randomized groups for post hoc tests to determine whether the effect would hold even with less statistical power. The results showed first that the causal model was the best fitting model in both groups and second that job resources at Time 1 predicted work engagement similarly and significantly ($\beta = .08, p < .01$) at Time 2 in both groups. Thus, even after controlling for the effect of baseline work engagement, job resources influenced work engagement positively in the long term.

Our results also underlined the role of job demands as the main initiator of the health impairment process. More specifically, our results showed that a set of various job demands, such as quantitative workload, demanding work content, and poor physical work environment, predicted burnout over a three-year period. These results are in line with numerous previous cross-sectional and longitudinal studies that have identified positive associations between job demands and burnout (for reviews, see Halbesleben & Buckley, 2004; Schaufeli & Enzmann, 1998).

Burnout, in turn, predicted depression and not vice versa. Because of the conceptual overlap between burnout and depression, the extent to which burnout differs from depressive symptomatology has been questioned (Taris, 2006). Using the same sample as in the current study, Ahola and Hakanen (2007) found that burnout at baseline predicted future cases of depression and similarly that depression at baseline predicted new cases of burnout. However, that study was not based on cross-lagged analyses with the consequence that the temporal order of burnout and depression remained unclear. In the present study, additional analyses showed that a model consisting of two second-order factors ("burnout" and "depression" factors) had an acceptable fit at both times, whereas a one-factor model ("general well-being") had a very poor fit at both occasions, thus indicating a lack of any substantial item overlap between burnout and depression. Taking into account the highly chronic nature of both psychological states, we consider our findings noteworthy in their suggestion that burnout may in fact lead to depression rather than vice versa or that the development may occur "in tandem" (McKnight & Glass, 1995).

We also found two cross-lagged effects intertwining the motivational and health impairment processes. As expected by the JD-R model, lack of job resources predicted burnout three years later. In line with the assumptions of JD-R model, the impact of job resources on burnout was, however, clearly weaker than the impact of job demands (Schaufeli & Bakker, 2004). Unexpectedly, we also found a significant, although very weak, negative effect of job demands on work engagement. Although job resources are expected to be the major source of work engagement, job demands may also somewhat diminish employee vigour and dedication directly (e.g., Mauno et al., 2007). In addition, since job demands and resources are mostly intertwined, Halbesleben and Buckley (2004) have argued that it is probably unlikely that consistent support would be found for a model that completely differentiated demands and resources when predicting outcomes. However, it is noteworthy that the effect of job demands on engagement disappeared after adding home demands and home resources in the best fitting JD-R model on work engagement and burnout. In addition, we did not detect a longitudinal relationship between burnout and organizational commitment. Moreover, in a previous cross-sectional study by Hakanen and his colleagues (2006), organizational commitment was more strongly associated with work engagement than with burnout. Finally, similarly to some previous studies (Hakanen et al., 2006; Hallberg & Schaufeli, 2006), we found positive synchronous correlations between work engagement and health. However, we did not find cross-lagged effects between engagement and health in the

complete JD-R model. More longitudinal studies with different occupational groups are needed to explore whether work engagement may promote health or vice versa and whether the relationship could even be reciprocal.

In this study, we also investigated the potential reversed and reciprocal cross-lagged effects in the JD-R model. On the basis of Hobfoll's conservation of resources theory (1998), it would be plausible that resource losses suffered in the health impairment process would result in loss spirals; in other words, not only would burnout increase future depression, but depression could also lead to increased future burnout. In a similar vein, the resource gain detected in this study could be followed by gain spirals in which, for instance, job resources and work engagement would reciprocally stimulate each other (de Lange et al., 2008). However, we did not find any significant reversed associations, which in previous studies have typically been shown to be weaker than the causal associations (e.g., de Lange et al., 2004) especially among those who (as do most dentists) tend to stay in the same job (de Lange et al., 2008). Evidently, our results are in line with the causally mediated processes assumed in the JD-R model (Schaufeli & Bakker, 2004).

Do home demands and resources matter?

Although home characteristics have been associated with burnout and engagement (e.g., Bakker et al., 2005; Halbesleben, 2006; Montgomery et al., 2003; Peeters, Montgomery, Bakker, & Schaufeli, 2005), the role of home demands and home resources in the development of burnout and work engagement has so far been investigated poorly and only few cross-sectional studies have been published on the topic. In the present study, the assumption that home resources and home demands would influence work engagement and burnout beyond the impact of job resources and job demands was not supported. In contrast, our findings support the view that the work environment is the major source of work-related states of well-being, such as burnout and engagement (Maslach, Schaufeli, & Leiter, 2001; Schaufeli & Taris, 2005; Warr, 1999). However, we found a well-fitting model with first a cross-lagged effect of job demands on burnout, and then a significant reversed cross-lagged effect of burnout on future home demands (i.e., operationalized as quantitative and negative home demands, and negative spillover from family to work). In their review on burnout research, Schaufeli and Enzmann (1998, p. 89) concluded that "taken together, there is no conclusive evidence on negative spillover of burnout to private life." Our results tentatively suggest that high job demands and burnout (the health impairment process) may, over time, spill over to home. A similar process was found in a qualitative study in which 22 burned-out employees were interviewed (Hakanen, 2004b). In order to cope with high job demands and increasing job strain, these employees had invested an increasing amount of resources in work at the expense of recovery and recreation during their leisure time. The resulting loss of future resources led to higher job strain and burnout, and consequently to an increased sense of being overwhelmed by home demands (e.g., taking care of the children, cleaning the house).

Limitations

At least four limitations should be mentioned when evaluating the present study. First, all our measures were based on self-reports, thus causing a concern for a common method bias. However, recently Spector (2006) argued that many times in surveys common method bias seems to be more of an "urban legend." Nevertheless, future research including, for instance, physician-diagnosed depression, register-based job retention, and other reported measures of

job conditions and home settings would reduce common method variance and offer additional strength for testing the JD-R model. On the positive side, our study was based on a longitudinal design, which diminishes the risks for common method bias (Doty & Glick, 1998).

Second, we tested our mediated process model at only two time points. Although it is possible to examine pairs of cross-lagged associations in a full panel design (Cole & Maxwell, 2003; Taris & Kompier, 2006) a comprehensive testing of the study model would require at least three waves. Moreover, use of two waves enables the investigation of only partial mediation (Taris & Kompier, 2006). However, the two waves enabled the use of a full cross-lagged panel design as suggested by Zapf and his colleagues (1996) and is thus an improvement on cross-sectional designs, which make up the majority of studies. Moreover, the rather high stabilities of the mediators and other variables investigated further strengthen the validity of the longitudinal cross-lagged associations found in this study.

Third, some of the cross-lagged effects found in this study were relatively weak. Especially the effect of job resources on future engagement was weaker than the other theoretically salient associations in the JD-R model. One explanation for this finding could be the relatively high stability of work engagement (e.g., Mauno et al., 2007). Too long time lags may lead to an underestimation of the true causal impact (Zapf et al., 1996). The three-year follow-up period may have been optimal, for example, to investigate the association between job demands and burnout, but perhaps not so for establishing a strong impact of job resources on work engagement. It should be noted, however, that we controlled for the autoregressive effect of each latent variable at T1 on the same variable at T2, and the relatively stable nature of many psychosocial concepts often means that the predictors fail to account for any additional variance in the outcome variable (Taris & Kompier, 2006). Thus, in spite of the moderate level of effects, the results were found to be meaningful and supportive of the JD-R model.

Fourth, the present study focused on one profession only, dentists. However, the study group comprised a large nationally representative sample of Finnish dentists. It is noteworthy that in Finland, in contrast to many other countries, most dentists (approximately half of whom are employed in the public sector and half in the private sector) do not work solo but in teams and/or in work units as part of larger health care organizations. Typical dental workplaces involve dentists, dental specialists, e.g., oral surgeons or orthodontists, dental hygienists and assistants, receptionist(s), equipment maintenance assistant(s), and possibly other related employees. In addition, because supportive cross-sectional evidence concerning the JD-R model among a variety of professions and nationalities already exists (e.g., Bakker et al., 2005; Hakanen et al., 2006; Llorens et al., 2006; Schaufeli & Bakker, 2004), we assume that our findings might lend themselves to cautious generalization to other occupational sectors.

Conclusions and implications

The motivational and health impairment processes assumed in the JD-R model were supported in this longitudinal study. It follows from the JD-R model that rather than focusing on individual factors to increase employee health and well-being, corporate health promotion and prevention programmes should target workplace factors: that is, they should be aimed at increasing job resources in order to promote engagement and commitment and at decreasing job demands in order to prevent burnout and ill health. In that sense, employee health and well-being is not only a “private” issue but a company issue as well, and thus a

social responsibility of employers. At a strategic level, our results suggest that occupational health professionals and HR professionals should collaborate in designing a comprehensive “Integral Health Management” system (Zwetsloot & Pot, 2004). The former actors may primarily focus on the health impairment process and the latter actors on the motivational process. The JD-R model offers a valuable heuristic tool for occupational health efforts to tackle distress and illness and for HRM efforts to promote the optimal functioning, motivation, and flourishing of employees (Linley, Joseph, Harrington, & Wood, 2006).

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