

## RESEARCH ARTICLE

# Crossover of Exhaustion between Dentists and Dental Nurses

Jari J. Hakanen<sup>1\*†</sup>, Riku Perhoniemi<sup>1</sup> & Arnold B. Bakker<sup>2</sup>

<sup>1</sup>Development of Work and Organizations, Finnish Institute of Occupational Health, Helsinki, Finland

<sup>2</sup>Erasmus University Rotterdam, the Netherlands

### Abstract

The aim of this study was to investigate the conditions under which job-related exhaustion may transmit (cross over) from dentists to dental nurses and vice versa. We conducted a cross-sectional survey study among 470 Finnish dentist–dental nurse dyads and used moderated structural equation modelling analyses. We found no support for the direct crossover of exhaustion from one work partner to the other. Instead, we found that exhaustion transferred from dentists to dental nurses only when collaboration was frequent and dental nurses perceived the collaboration as friendly or consisting of mutual feedback. In contrast, dentists were not affected by dental nurses' exhaustion. These results indicate that exhaustion can be contagious in work dyads and may be fuelled by positive and frequent interpersonal relationships when the partner who is higher in the hierarchy has high (versus low) levels of exhaustion. Thus, interpersonal and hierarchical relationships among work partners may play an important role in the crossover process. Limitations and implications are mentioned. Copyright © 2013 John Wiley & Sons, Ltd.

Received 15 October 2012; Revised 25 April 2013; Accepted 2 May 2013

### Keywords

crossover; burnout; cooperative behaviour; dentistry; exhaustion

### \*Correspondence

Jari Hakanen, Development of Work and Organizations, Finnish Institute of Occupational Health, Topeliuksenkatu 41 a A, FI-00250 Helsinki, Finland.

†Email: jari.hakanen@ttl.fi

Published online 30 May 2013 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/smi.2498

## Introduction

Job burnout is a severe problem in human service professions, especially among healthcare professionals (Schaufeli, 2007; Westman & Bakker, 2008). The risk of burnout (particularly exhaustion) has also been noted in the dental practice (Hakanen, Schaufeli, & Ahola, 2008; Te Brake, Bouman, Gorter, Hoogstraten, & Eijkman, 2008). In dentistry, as in many other healthcare professions, burnout may result from various job demands, such as emotional (meeting a fearful patient), cognitive (choosing the right procedure), physical (difficult work postures) and quantitative (limited time for each patient) demands (e.g. Gorter, 2000; Hakanen et al., 2008). Still another potential source of burnout is an exhausted work partner, because dentists and dental nurses typically collaborate as a dyad.

Smooth, positive collaboration is vital for efficient job performance and is presumably also important for both work partners' well-being (Chang, Ma, Chiu, Lin, & Lee, 2009). However, in daily trustful and open collaboration work, partners may also affect each other's workload and exchange negative emotions and moods.

Indeed, some recent studies suggest that close collaboration may actually facilitate the transfer of burnout from one professional to the other (e.g. Westman, Bakker, Roziner, & Sonnentag, 2011).

The process that occurs when job strain transfers from one person to another in face-to-face contact is called *crossover* (Bolger, DeLongis, Kessler, & Wethington, 1989; Westman, 2001, 2011). In the present study, we aim towards a better understanding of the role of positive interpersonal relationships in the crossover of exhaustion in dentist–dental nurse working dyads. On the basis of the results of studies conducted in teams (Totterdell, Kellet, Teuchmann, & Briner, 1998; Westman et al., 2011), we argue that positive and frequent interpersonal relationships may function as a 'double-edged sword'; although the characteristics of good relationships such as mutual feedback protect workers from exhaustion, on a dyad level, positive interactions may also actually enable the crossover of exhaustion, when the level of exhaustion is high and interaction is frequent. Because of hierarchical relationships, we also expect that exhaustion is more likely to cross over from dentists to dental nurses than vice versa.

### How does job strain cross over?

Job strain may cross over from one person to another by the means of two main mechanisms: direct and indirect crossovers (Westman, 2001). *Direct crossover* (or contagion) of emotion is believed to happen through an empathic reaction (empathic identification) in which the receiver either consciously imagines feeling what the other party is expressing or automatically 'catches' the emotion through spontaneous mimicry (Bakker, Westman, & Van Emmerik, 2009; Barsade, 2002). Experimental studies have shown how the 'sender's' expression of positive and/or negative emotions induces an automatic and congruent emotional reaction in the 'receiver' (Bakker, Westman, & Schaufeli, 2007; Neumann & Strack, 2000). In contrast, *indirect crossover* takes place through altered communication, for example, through decreased social support or undermining behaviour in the case of strain crossover. In their study of Russian army officers and their spouses, Westman, Vinokur, Hamilton, and Roziner (2004) found that social undermining mediated the effect that army officer distress had on partners' marital dissatisfaction. Similarly, Cowlshaw, Evans, and McLennan (2011) showed that emergency service workers' work-family conflict led to their partners' heightened distress through withdrawn marital behaviour. However, it has been shown that different aspects of social interaction (e.g. cohesiveness and social support) may not only mediate but also moderate the crossover process (Westman et al., 2011). In addition to direct and indirect crossovers, the crossover of strain may be explained by 'common stressors' (e.g. Westman, 2001), shared stressors, for example, in working conditions. This third variable may explain the association between the partners' strain, which would then be a spurious effect.

Although most studies on crossover have been conducted among spouses, some studies have shown that job strain and burnout may also cross over between individuals who closely collaborate at the workplace. For example, Westman and Etzion (1999) found evidence of crossover of job-induced strain from school principals to teachers and vice versa. Moreover, social undermining by principals increased teachers' job-induced strain and burnout. In a nursing context, Totterdell et al. (1998) found that community nurses' individual mood was strongly linked to their team's collective mood, and this relationship was not explained by shared daily hassles. In their study among nurses working in 80 intensive care units in 12 different European countries, Bakker, Le Blanc, and Schaufeli (2005) also found evidence of cumulative and contagious burnout within teams.

Several previous studies have also found support for the direct crossover of well-being. For example, Westman, Keinan, Roziner, and Benyamini (2008) demonstrated direct crossover of self-rated health in a study of Russian couples. In addition, Bakker and Demerouti

(2009) discovered direct crossover of work engagement between Dutch working couples. On the basis of this literature, we formulated our first hypothesis:

Hypothesis 1: The exhaustion of dentists and dental nurses is positively related, thus indicating direct crossover.

### Moderators of the crossover effect

Several previous studies have sought to identify conditions under which crossover is most likely. Some studies have focused on personal characteristics and found that, for example, perspective taking (Bakker & Demerouti, 2009) and susceptibility to emotional contagion (Bakker, Schaufeli, Sixma, & Bosveld, 2001) make crossover more likely. Other studies have focused on social interaction and interpersonal relationships. The frequency of interaction and proximity at work in particular have been considered important preconditions and enhancing factors for crossover, because frequent interaction provides opportunities for mutual influence at work. Bakker and Schaufeli (2000) found that teachers' perceptions of the prevalence of burnout among their colleagues were associated with teachers' own burnout only when they reported talking frequently about work problems with their colleagues. In addition, Bartel and Saavedra (2000) found that a higher probability of frequent contact (measured as task interdependence) increased negative mood congruence in work teams. Using a daily diary study design, Bakker and Xanthopoulou (2009) also found that the crossover of work engagement (the opposite of burnout) among working dyads only took place on days when the dyad communicated more frequently than usual.

In addition to frequency, the quality of interpersonal relationships (openness and sharing) can also affect the crossover of exhaustion. Organizational and interpersonal job resources such as healthy organizational climate and social support are known to positively affect employee well-being (e.g. Bakker, Demerouti et al., 2005; Haines, Hurlbert, & Zimmer, 1991). Moreover, good nurse-physician collaboration positively associates with occupational well-being among nurses (Zangaro & Soeken, 2007). Interestingly, a few studies also suggest that good interpersonal relationships may be related to a higher rather than a lower risk of strain crossover. Lavee and Ben-Ari (2007) found among Israeli working couples that the negative mood of a wife (husband) and the stress of a husband (wife) were associated only among couples who rated their marital quality as high. In addition, Song, Foo, Uy, and Sun (2011) investigated couples in which one partner was unemployed and found that marital satisfaction moderated the crossover of distress so that for unemployed husbands, higher marital satisfaction increased the probability of 'catching' wives' distress. In a study by Totterdell et al. (1998), the link between team-level mood and individual mood (positive and negative) was

strongest for those nurses who perceived the team climate as positive. In a similar vein, Westman et al. (2011) found in their study that exhaustion crossed over from teams to individual employees only when teams had high levels of cohesiveness or collegial social support. However, to our knowledge, no studies have examined the crossover of exhaustion (burnout) among working dyads in health care or considered how frequent and positive interpersonal relationships may affect the crossover effect.

According to the job demands–resources (JD-R) model, working conditions can be categorized into job demands and resources (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). In contrast to the energy-draining job demands (e.g. workload, role ambiguity and emotional dissonance), job resources are those physical, psychological, social or organizational aspects of the job that may boost intrinsic and extrinsic motivation at work on the one hand and negatively influence burnout on the other (Demerouti et al., 2001). Several studies have suggested that social/interpersonal job resources are salient to employee well-being and that they can be distinguished from other types of job resources (Bakker, Van Emmerik, & Van Riet, 2008; Hakanen & Lindbohm, 2008; Tims, Bakker, & Derks, 2012). In the present study, on the basis of exploratory interviews with dentists and dental nurses on the relevant aspects of daily collaboration in the dyads, we investigate two specific social job resources, namely mutual feedback and friendliness of the partner. Mutual feedback is a work-related social job resource and is directly linked to work performance (Hackman & Oldham, 1980), whereas friendliness refers more generally to positive, respectful interaction between work partners. Thus, mutual feedback is more closely related to in-role performance, and friendliness to extra-role performance.

Both these social job resources are characterized by open-minded and trustful relationships in the dyad and, as suggested by the JD-R model, may protect from burnout at the individual level. However, when working frequently with an exhausted partner, these resources may actually facilitate the crossover of exhaustion. This is because positive interrelationships make the receiver more open-minded and receptive to the sender's feelings, which in turn may lead to either a conscious or unconscious empathic reaction in the receiver, thus enabling the crossover (Barsade, 2002). Therefore, when a dental nurse, for example, feels that his or her exhausted partner, a dentist, is acting kindly towards him or her and showing positive gestures, this friendliness may create openness and empathy in the nurse and hence enable the crossover of exhaustion from the dentist to the dental nurse in regular and intensive collaboration (see also Westman et al., 2011). Thus, we hypothesize that both frequent and positive collaboration is needed for the crossover of exhaustion. This is because basically, if there is

positive collaboration but only occasional interaction within the dyad, crossover of exhaustion is unlikely. Similarly, if there is frequent interaction, but it is not positive, crossover is unlikely because openness and empathy are missing from the relationship. On the basis of crossover theory and previous studies suggesting that both frequency of interaction and quality of interpersonal relationships may moderate the crossover process, we formulated our second hypothesis:

**Hypothesis 2a:** Frequency of contact and friendliness of the partner moderate the relationship between dentists and dental nurses' exhaustion. The crossover of exhaustion will be strongest when there is frequent (versus infrequent) contact and when friendliness of the partner is high (versus low).

Similarly, when collaboration is functioning well as a result of mutual constructive feedback, sharing successes and mutually understanding the need to jointly develop working practices, intensive collaboration with a relatively exhausted partner may form a breeding ground for more empathy and thereby for more crossover of exhaustion. Hence,

**Hypothesis 2b:** Frequency of contact and mutual feedback moderate the relationship between dentists and the dental nurses' exhaustion. The crossover of exhaustion will be strongest when there is frequent (versus infrequent) contact and when mutual feedback is high (versus low).

### **Impact of hierarchical relationship in dyad**

In addition to the quality of interpersonal relationships, the crossover effect may also depend on contextually defined roles and the status or power differences between dentists and dental nurses. Only a few studies have focused on the role of professional hierarchy in the crossover process, for example, in leader–follower relationships. The role of a supervisor usually involves more or less actively guiding and coaching subordinates and expressing views and moods, whereas the role of followers consists of taking guidance. Therefore, the few existing studies have found that the crossover process runs mostly from supervisors to employees, i.e. leaders' moods affect followers' moods (e.g. Johnson, 2009; Sy, Cote, & Saavedra, 2005). Similarly, working dyads in health care are often based on a professional and hierarchical (doctor and nurse) relationship. In dentistry, as in many professional relationships, one partner (here the dentist) has more responsibility and authority regarding patient care. For example, dentists are responsible for the decisions concerning treatment. Therefore, they have a more active role in the interaction and more power to influence dental nurses' moods and well-being. Consequently, exhaustion is more likely to cross over from the dentist to the dental nurse than the other way round. This leads to our final hypothesis:

Hypothesis 3: The hierarchical relationship in the dyad moderates the crossover of exhaustion so that under conditions of frequent contact and positive interpersonal relationships (friendliness and mutual feedback), the exhaustion of dentists will cross over to dental nurses, rather than vice versa.

## Method

### Procedure and participants

The sample consisted of 470 dentist–dental nurse dyads. We selected a group of dentists that had participated in a study for dentists only in early 2010. These dentists were then contacted via an invitation letter to participate in the present crossover study. The letter included information on the project, a prepaid registration form and similar material to be given to the dental nurse with whom they mostly collaborated. Both parties signed up for the study independently of each other. All in all, 551 dental nurses and 608 dentists indicated their willingness to participate in the study, and 504 dental nurses (response rate 92%) and 582 dentists (response rate 48% for all dentists who were originally approached and 96% for those who had agreed to participate) responded to the questionnaire. After the respondents whose working partners had not responded were excluded, the final dataset consisted of 470 dentist–dental nurse dyads. In total, 80% of the dentists were female, and all dental nurses, except one, were female. Of the dental nurses, 95% had dental assistant or practical nurse (dental and oral health care) qualifications, with training of 2–3 years; 0.9% had other nursing qualifications; 2.1% were dental hygienists; and 2.1% ( $N=10$ ) had no formal nursing qualifications. The mean age for dentists was 50.3 years [standard deviation (SD)=7.0] and for dental nurses 47.9 years (SD=9.2). On average, job tenure for dentists was 24.5 years (SD=7.4) and for nurses 22.1 years (SD=10.5), and the partners had been working together for 8.9 years (SD=7.8).

### Measures

*Exhaustion* was measured using five items from the Finnish version of the Maslach Burnout Inventory—General Survey (Kalimo, Hakanen, & Toppinen-Tanner, 2006). An example of an item is ‘I feel emotionally drained by my work’. The items were rated on a seven-point frequency scale ranging from 0 (*never*) to 6 (*daily*). Cronbach’s alphas were  $\alpha=0.91$  for dentists and  $\alpha=0.90$  for dental nurses. Exhaustion is considered the core dimension of burnout (Roelofs, Verbraak, Keijsers, De Bruin, & Schmidt, 2005; Shirom & Melamed, 2006) and may later lead to other burnout symptoms, i.e. to cynicism and reduced professional efficacy (Lee & Ashforth, 1996).

*Frequency of contact* between the partners was measured with one item enquiring ‘How many hours

per week do you generally work together with your work partner?’ The inter-rater reliability was fairly good, as dental nurses and dentists’ estimates correlated highly ( $r=0.75$ ,  $p<0.01$ ). *Interpersonal relationships* were assessed using two self-developed scales to which the participants responded using a five-point scale (1 = *very rarely or never*, 5 = *very often or always*). *Friendliness of the partner* was measured using a four-item scale including ‘My work partner is friendly towards me’; ‘My work partner shows consideration, e.g. by smiling at me’; ‘My work partner tries to get me into a good mood’; and ‘Sometimes my work partner and I discuss matters not related to work’. This measure was applied from a general scale measuring friendliness at the workplace, which has shown good reliability and validity (Perhoniemi & Hakanen, 2010). Cronbach’s alphas were  $\alpha=0.87$  for dental nurses and  $\alpha=0.82$  for dentists. *Mutual feedback* was measured using a four-item scale. The items were ‘Do you receive performance-related feedback from your work partner?’ ‘Do you give performance-related feedback to your work partner?’ ‘Do you and your work partner discuss your work and the need to develop work practices?’ and ‘When you and your work partner succeed well in patient care, do you share the success together?’ Cronbach’s alphas were  $\alpha=0.86$  for dental nurses and  $\alpha=0.83$  for dentists.

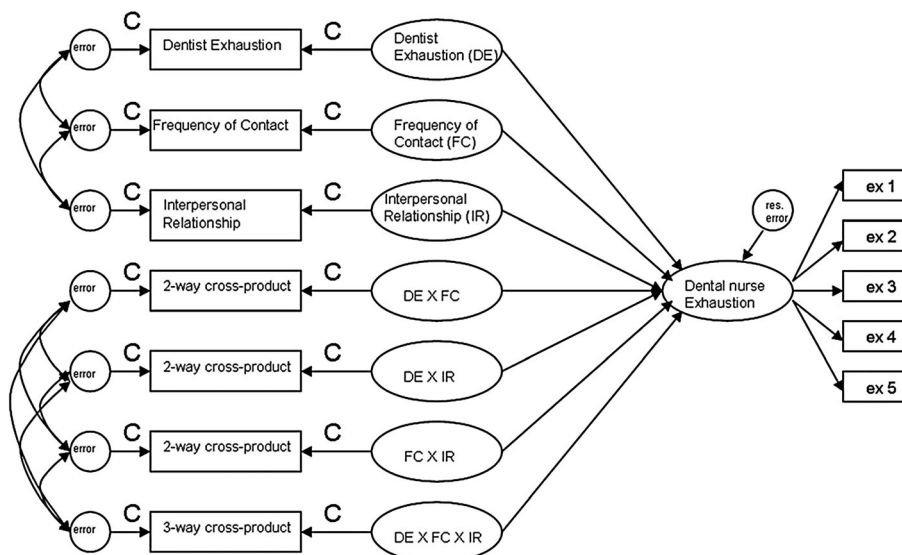
### Data analysis

We tested our hypotheses using the Amos 18.0 software package (Arbuckle, 2005) and moderated structural equation modelling (MSEM) following the procedure of Cortina, Chen, and Dunlap (2001) and Mathieu, Tannenbaum, and Salas (1992). Each model included seven exogenous latent variables: three latent main effect variables (exhaustion, frequency of contact and either one of the two variables indicating interpersonal relationships), 3 two-way latent interaction variables and 1 three-way latent interaction variable. See Figure 1 for our research model.

The three exogenous latent main effect variables each had one indicator: for exhaustion and friendliness/mutual feedback, a z-score calculated from the sum scores of the multi-item scales, and for frequency of contact, a z-score of the single item. The endogenous latent variable, exhaustion, was indicated by five items.

The interaction variables were calculated as multiplications of the three independent z-score variables including 3 two-way interaction terms: Exhaustion  $\times$  Frequency of contact, Exhaustion  $\times$  Either of the two dimensions of interpersonal relationships, and Frequency of contact  $\times$  Either of the two dimensions of interpersonal relationships. In addition, the three-way interaction term was the product of all three main effect factors.

We examined whether gender, age, and number of years spent working with one’s present partner were related to exhaustion in either partner. Only the gender of the dentists was related to their exhaustion. Thus, the models testing crossover from nurses to dentists



**Figure 1.** Study model for dentist–dental nurse crossover. All constrained paths and error variances are marked by C. res. error: residual error

included dentists' gender as a control variable. In addition, the factor analyses showed that the items of mutual feedback and friendliness loaded on two separate factors in both groups, as expected: The two-factor model consisting of 'mutual feedback' and 'friendliness' factors fit the data well [ $\chi^2(19) = 135.62$ , comparative fit index (CFI) = 0.93, normed fit index (NFI) = 0.92 for dentists and  $\chi^2(19) = 134.08$ , CFI = 0.95, NFI = 0.94 for dental nurses], whereas the one-factor 'interpersonal relationships' model indicated by the items of both social job resources fit the data poorly ( $\chi^2(21) = 573.04$ , CFI = 0.66, NFI = 0.66 for dentists and  $\chi^2(21) = 491.12$ , CFI = 0.77, NFI = 0.77 for dental nurses).

For evaluating the general fit of the models, we used the goodness-of-fit index and the root mean square error of approximation as absolute goodness-of-fit indices. Three relative fit indices were also assessed: the CFI, the NFI and the Tucker–Lewis index. Root mean square error of approximation values below 0.05 are indicative of an excellent fit, and values smaller than 0.08 are still acceptable (Browne & Cudeck, 1993). Index values greater than 0.90 (and preferably greater than 0.95) are considered to indicate a good fit (Hu & Bentler, 1999).

## Results

### Descriptive statistics

The means, standard deviations and inter-correlations between the study variables are presented in Table I. The inter-correlation between exhaustion of dentists and dental nurses is non-significant; thus, Hypothesis 1 on direct crossover was rejected. In addition, Table I shows that neither dental nurses' friendliness nor mutual feedback was significantly related to dentists'

exhaustion. In contrast, for dental nurses, both measures of social job resources were negatively related to their own exhaustion. Frequency of contact did not correlate with the two exhaustion variables.

### Indirect crossover from dentists to dental nurses

With two indicators of positive interpersonal relationships and the possibility of bi-directional crossover, we tested four MSEM models altogether. They all fit the data reasonably well (Table II). The results of the MSEM analyses are presented in Table III. In the first two MSEM models, the moderated crossover of exhaustion runs from dentists to dental nurses.

Model 1 included dentists' exhaustion, frequency of contact and friendliness perceived by the dental nurse, their two-way and three-way product terms as independent variables and dental nurses' exhaustion as the dependent variable. Dentists' friendliness had a negative main effect on dental nurses' exhaustion (Table III) ( $\beta = -0.29$ ,  $p < 0.001$ ), whereas dentists' exhaustion and frequency of contact had no main effects on dental nurses' exhaustion. We also found no significant two-way interaction effects. However, as hypothesized, the three-way interaction term had a significant relationship with dental nurses' exhaustion ( $\beta = 0.17$ ,  $p < 0.01$ ). A comparison of the models with or without the three-way interaction effect showed that eliminating the interaction path worsened the fit of the model [ $\Delta\chi^2 = 6.98$ ,  $\Delta df$  (degrees of freedom) = 1,  $p < 0.01$ ]. We used simple slope analyses (Aiken and West, 1991) to examine the direction of the interaction effects. Consistent with Hypothesis 2a, the crossover of exhaustion from dentists to dental nurses was strongest when dentists were perceived as friendly and when contact between the

**Table I.** Means, standard deviations and inter-item Pearson correlations of the study variables ( $N=470$ )

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
Dentists											
1. Gender (1 = female, 2 = male)											
2. Exhaustion	1.72	1.33	-0.16	—							
3. Frequency of contact	27.76	8.96	-0.09	0.08	—						
4. Friendliness of dental nurse	4.50	.59	-0.02	-0.06	-0.01	—					
5. Mutual feedback	3.36	.74	-0.01	0.04	0.02	0.50	—				
Dental nurses											
6. Exhaustion	1.66	1.29	-0.05	0.01	0.08	-0.08	-0.08	—			
7. Frequency of contact	30.16	8.88	-0.08	0.09	0.75	-0.06	-0.06	0.01	—		
8. Friendliness of dentist	4.36	0.71	-0.06	-0.02	-0.02	0.42	0.32	-0.26	-0.10	—	
9. Mutual feedback	3.32	0.90	-0.10	0.04	-0.00	0.34	0.42	-0.25	-0.04	0.57	—

Note. Correlations >0.15 are statistically significant,  $p < 0.001$ ; correlations between 0.11 and 0.14 are statistically significant,  $p < 0.01$ ; and correlation 0.10 is statistically significant,  $p < 0.05$ . SD: standard deviation.

**Table II.** Fit statistics for study models ( $N=470$ )

Model	Model description (independent variables)	$\chi^2$	df	GFI	CFI	NFI	TLI	RMSEA
Crossover of exhaustion from dentists to dental nurses								
M1	Frequency of contact, friendliness of dentist, exhaustion and their product terms	124.26	45	0.96	0.94	0.92	0.92	0.063
M2	Frequency of contact, mutual feedback, dentists' exhaustion and their product terms	111.04	45	0.96	0.95	0.93	0.93	0.057
Crossover of exhaustion from dental nurses to dentists								
M3	Frequency of contact, friendliness of dental nurse, exhaustion and their product terms	123.48	56	0.96	0.96	0.93	0.94	0.052
M4	Frequency of contact, mutual feedback, dental nurses' exhaustion and their product terms	102.55	56	0.97	0.97	0.94	0.96	0.043

GFI: goodness-of-fit index; CFI: comparative fit index; NFI: normed fit index; TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation; df: degrees of freedom.

partners was frequent (Figure 2 illustrates the interaction effect of Dentists' exhaustion  $\times$  Frequency of contact  $\times$  Friendliness on dental nurses' exhaustion). In addition, the simple slope tests showed that the slope illustrating the condition as high in dentists' friendliness (+1SD) and high in frequency of contact (+1SD) differed significantly from 0 [est. = 0.27, standard error (SE) = 0.09,  $t(462) = 2.93$ ,  $p < 0.01$ ], whereas the other three slopes did not significantly differ from 0, thus lending further support to Hypothesis 2a.

Model 2 included dentists' exhaustion, frequency of contact, mutual feedback perceived by the dental nurse and their product terms as independent variables. Mutual feedback had a negative main effect on dental nurses' exhaustion, ( $\beta = -0.27$ ,  $p < 0.001$ ), whereas no other main effects or significant two-way interactions were found (Table III). However, as predicted, there was a significant three-way interaction effect on dental nurses' exhaustion ( $\beta = 0.16$ ,  $p < 0.05$ ). Comparing the models with or without the three-way interaction effect showed that eliminating the interaction path worsened model fit ( $\Delta\chi^2 = 6.45$ ,  $\Delta df = 1$ ,  $p < 0.05$ ). As Figure 3 (the interaction effect of Dentists' exhaustion  $\times$  Frequency of contact  $\times$  Mutual feedback) shows, the crossover of exhaustion from dentists to dental nurses was strongest under conditions of mutual feedback and

frequent contact between the partners. Furthermore, the slope illustrating the condition of high mutual feedback (+1SD) and high frequency of contact (+1SD) differed significantly from 0 (est. = 0.21, SE = 0.09,  $t(462) = 2.36$ ,  $p < 0.05$ ), whereas the other three slopes did not significantly differ from 0, thus supporting Hypothesis 2b.

**Indirect crossover from dental nurses to dentists**

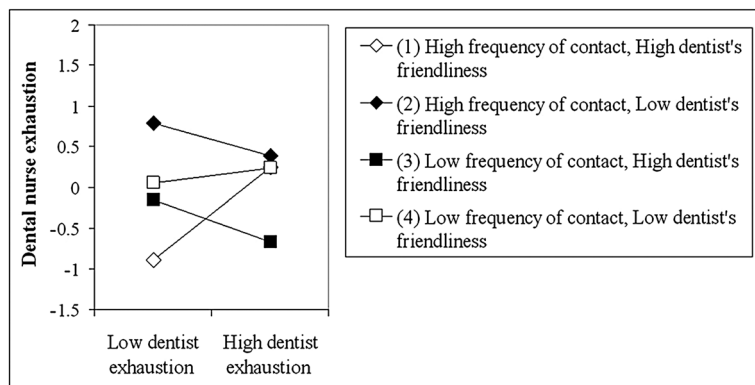
In the next set of analyses, we tested the moderator effects from dental nurses to dentists. Models 3 and 4 (Table II) included dental nurses' exhaustion, frequency of contact, two separate indicators of the quality of interpersonal relationships and their product terms as independent variables, and dentists' exhaustion as the dependent variable. Model 3 showed that only frequency of contact had a positive main effect on dentists' exhaustion ( $\beta = 0.11$ ,  $p < 0.05$ ; Table III). In addition, Dental nurses' exhaustion  $\times$  Friendliness had an interaction effect on dentists' exhaustion ( $\beta = 0.11$ ,  $p < 0.05$ ). Figure 4 shows that the crossover of exhaustion from dental nurses to dentists was strongest when the dentists perceived dental nurses as friendly. However, the simple slope analyses showed that neither the +1SD slope (est. = 0.08, SE = 0.07,  $t(462) = 1.25$ , non-significant) nor

**Table III.** Results of moderated structural equation modelling ( $N=470$ )

Model	Independent variables	$\beta$	SE	Explained variance
Crossover of exhaustion from dentists to dental nurses				
M1	Dentists' exhaustion (DE)	0.04	0.06	0.14
	Frequency of contact (FC)	0.11	0.07	
	Friendliness of dentist (F)	-0.29***	0.07	
	DE $\times$ FC	0.10	0.08	
	DE $\times$ F	-0.08	0.07	
	FC $\times$ F	0.06	0.10	
	DE $\times$ FC $\times$ F	0.17**	0.11	
M2	Dentists' exhaustion (DE)	0.03	0.07	0.12
	Frequency of contact (FC)	0.07	0.08	
	Mutual feedback (MF)	-.27***	0.07	
	DE $\times$ FC	0.06	0.08	
	DE $\times$ MF	0.01	0.07	
	FC $\times$ MF	-0.03	0.10	
	DE $\times$ FC $\times$ MF	0.16*	0.10	
Crossover of exhaustion from dental nurses to dentists				
M3	Dental nurses' exhaustion (DNE)	0.01	0.07	0.06
	Frequency of contact (FC)	0.11*	0.08	
	Friendliness of dental nurse (F)	-0.09	0.08	
	DNE $\times$ FC	0.06	0.08	
	DNE $\times$ F	0.11*	0.06	
	FC $\times$ F	0.06	0.10	
	DNE $\times$ FC $\times$ F	0.12	0.09	
M4	Dental nurses' exhaustion (DNE)	-0.01	0.07	0.03
	Frequency of contact (FC)	0.10	0.08	
	Mutual feedback (MF)	0.04	0.08	
	DNE $\times$ FC	0.07	0.09	
	DNE $\times$ MF	-0.01	0.08	
	FC $\times$ MF	0.11	0.09	
	DNE $\times$ FC $\times$ MF	0.02	0.11	

Note.  $\beta$  values are standardized. SE, standard error.

\*\*\* $p < 0.001$ ; \*\* $p < 0.01$ . \* $p < 0.05$ .



**Figure 2.** Interaction effect of dentists' exhaustion, frequency of contact and friendliness of dentist on dental nurses' exhaustion

the -1SD slope (est. = -0.06, SE = 0.06,  $t(462) = -1.09$ , non-significant) differed significantly from 0. In addition, the two other two-way and the three-way interaction effects were non-significant.

In Model 4, including dental nurses' exhaustion, frequency of contact, and mutual feedback as perceived by the dentists and their product terms as independent variables, neither dental nurses' exhaustion, frequency of

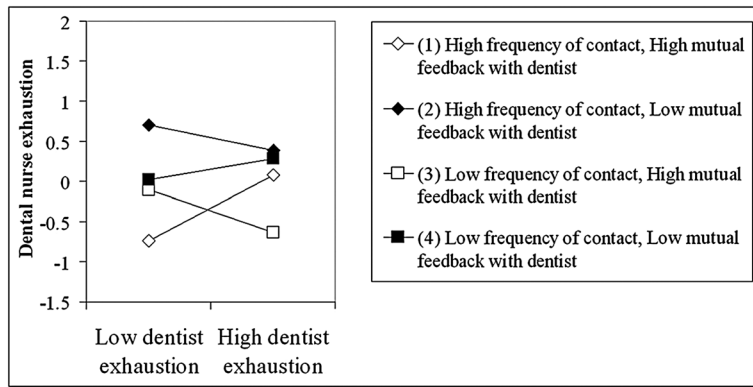


Figure 3. Interaction effect of dentists' exhaustion, frequency of contact and mutual feedback on dental nurses' exhaustion

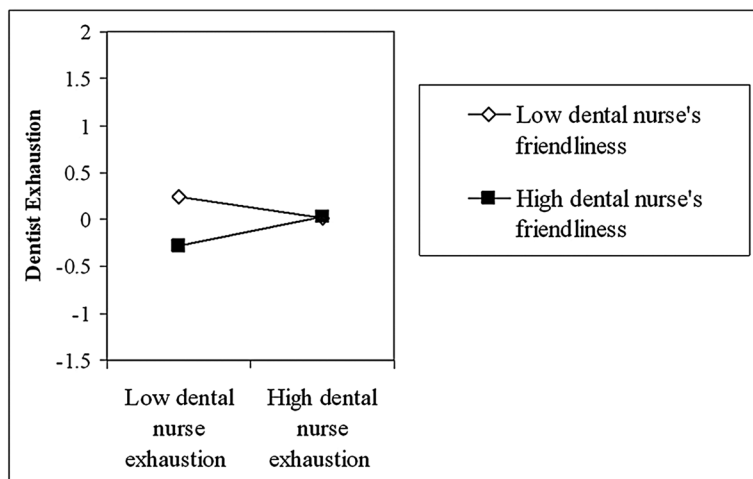


Figure 4. Interaction effect of dental nurses' exhaustion and friendliness of dental nurse on dentists' exhaustion

contact nor mutual feedback had main effects on dentists' exhaustion. In addition, we found no statistically significant two-way or three-way interaction effects.

The results based on Models 1–4 supported Hypothesis 3, which stated that the moderated crossover of exhaustion takes place from dentists to dental nurses and not vice versa.

### Discussion

In her seminal paper on burnout, Maslach (1976) reported that burnout rates among caring professions were lower for those professionals who expressed, analysed and shared their personal feelings with colleagues. Our study suggested that there may be a dark side to positive and open-minded communication and the sharing of emotions between working partners—particularly when the other partner experiences a relatively high level of exhaustion. More specifically, we investigated the crossover of exhaustion among 470 dentist–dental nurse dyads by hypothesizing that in addition to the direct relationship between exhaustion

of both work partners, three-way interaction effects also explain this crossover. We argued that the crossover of exhaustion would be strongest when there were both frequent contact and good interpersonal relationships in the dyad, indicated by friendliness and mutual feedback. In addition, we predicted that owing to the hierarchical relationship between the dentist and the dental nurse in the dyad, this moderated crossover effect would be evident only from dentists to dental nurses.

In general, the results of the MSEM analyses supported our hypotheses. However, we found no support for the direct crossover of exhaustion in the dyads. Whereas several studies have observed direct crossover with a variety of different well-being and health measures (e.g. Bakker & Demerouti, 2009; Bakker, Shimazu, Demerouti, Shimada, & Kawakami, 2011; Westman and Bakker, 2008; Westman et al., 2004), others have found no main effects to support direct crossover. For example, Westman and Etzion (1999), who also studied co-workers at different hierarchical levels, found a direct crossover of principals and



teachers' job tension but no evidence for the crossover of burnout. In the present study, both friendliness and mutual feedback were negatively related to the exhaustion of the dental nurses but unrelated to dentists' exhaustion. This finding suggests that for dental nurses, interpersonal job resources (in the dyad) may be more important for their well-being and that for dentists, other job resources (e.g. autonomy and skill variety) may play a more important role. Therefore, dental nurses may be more susceptible to contagion of exhaustion. For future research, it would be valuable to investigate more generally whether the mechanisms for contagion similarly differ between the followers and their leaders.

The non-significant association between the exhaustion of the working partners underlines our main finding that crossover may take place only under specific conditions. We found support for the hypotheses that the crossover of exhaustion from dentists to dental nurses was strongest in the dyads with frequent interaction and in which nurses perceived dentists' friendliness as high, or in which collaboration was characterized by high levels of mutual feedback. Thus, our study suggests that frequency of interaction is a prerequisite for the crossover of exhaustion in collaboration characterized by mutual feedback and friendliness. It is evident that frequent interaction provides opportunities for influencing each other, whereas friendliness and mutual feedback determine how much attention is given to the work partner. Thus, if the working partners have positive relationships but only work together occasionally, there is no crossover. Similarly, if there is frequent interaction, but it is not positive, exhaustion does not cross over, because in this case, no basis for empathy exists. It is noteworthy that although the main effects of dentists' friendliness and mutual feedback were negatively related to nurses' exhaustion, these impacts became reversed and increased the likelihood of dental nurses' exhaustion when dentists and dental nurses interacted frequently and when the dentist reported high (versus low) levels of exhaustion.

Our study contributes to the crossover theory in several ways. The results support the novel and counterintuitive idea that positive interpersonal relationships may sometimes have a compromising impact on employee well-being in a work dyad. Previous studies conducted in work teams (Totterdell et al., 1998; Westman et al., 2011) and among spouses (Lavee & Ben-Ari, 2007; Westman et al., 2011) have found conceptually similar results. Positive interaction such as social support usually protects from burnout (Halbesleben, 2006) and may buffer against the negative impact of job demands (Bakker, Demerouti et al., 2005). However, on a social level, when a person frequently communicates with an exhausted partner, supportive and friendly interaction with that partner can result in symptoms of exhaustion in the focal person as well. Presumably, positive interaction makes the receiver more

open-minded and receptive to the sender's feelings, which in turn may lead to an empathic reaction in the receiver and thus enable direct emotional contagion (Barsade, 2002). Previous studies among couples have shown that empathy as a tendency for perspective taking increases the likelihood of the crossover of well-being (Bakker & Demerouti, 2009; Bakker et al., 2011). We contributed to the crossover research by focusing on work partners who are not equal but at different levels of professional hierarchy. We theorized that because of the hierarchical work relationship between the dentist and the dental nurse, the moderated crossover of exhaustion would take place from dentists to dental nurses and not the other way round. The results supported this assumption and indicated that power relations between employees and dyads may be important for the crossover of well-being. Our study suggests that because dentists have more authority in the dentist-dental nurse collaboration in patient work, their negative moods are also more likely to transfer to dental nurses than the other way round. This finding is in line with previous studies on the contagion of a leader's negative mood to followers' moods (for a review, see Rajah, Song, & Arvey, 2011; Skakon, Nielsen, Borg, & Guzman, 2010). For example, Glaso and Einarsen (2006) found that shared affective experiences during leader-follower interaction were equal for leaders and subordinates but that these emotional experiences were associated with job and life satisfaction only among subordinates. This finding suggests that leaders' emotions affect followers' well-being to a greater extent than the other way round. In addition, two studies on coach and athlete burnout (Price & Weiss, 2000; Vealey, Armstrong, Comar, & Greenleaf, 1998) showed that coaches' burnout was associated with athletes' negative perceptions of coaches' behaviour in training and that these perceptions further associated with athletes' burnout.

Finally, this study also contributed to the JD-R model by suggesting that even though job resources are usually beneficial for employee well-being and organizational outcomes, on a social level and at least with regard to social job resources, their impact may also be negative in cases of colleagues with symptoms of exhaustion.

### Practical implications

Our results have some valuable practical implications. First, this study suggests that under certain conditions, exhaustion may cross over from one person to another. Thus, crossover of exhaustion can lead to the increase of the overall prevalence of exhaustion in organizations (Westman et al., 2011), may further spill over to employees' families (Demerouti, Bakker, & Schaufeli, 2005) and also risk the quality of care (Poghosyan, Clarke, Finlayson, & Aiken, 2010). Our results suggest that crossover can take place particularly when one's partner's exhaustion is already relatively high. This finding emphasizes the utmost importance of early

prevention of burnout: preventing individual employees from burnout may also prevent the crossover of burnout and consequently protect co-workers from burnout symptoms. Organizations would benefit from using, for example, organizational surveys to reveal the most significant early warning signs, i.e. adverse work characteristics that predict burnout (Leiter et al., in press; Maslach & Leiter, 2008). Employees should ensure sufficient detachment from work during leisure and also use other strategies to recover from work efforts (Fritz & Sonnentag, 2006).

Second, our study suggests that under certain circumstances, positive interpersonal relationships may even enable the crossover of exhaustion. In fact, increasing opportunities to share and discuss negative experiences, such as job strain at work, may have the side effect of intensifying the crossover of negative moods. Therefore, although investing in improving social skills and communication at work is in many respects beneficial, it may not be the best strategy when some employees of the organization are already exhausted. Instead, under these conditions, it might be more valuable to increase other job resources, for example, job autonomy and role clarity and, more specifically, to decrease energy-draining job demands such as workload.

Third, our study suggests that power and hierarchical position in working dyads may determine the dominant direction of crossover, i.e. in this case, from dentists to dental nurses. More generally, supervisory tasks inevitably include giving feedback, clarifying work roles and acting supportively. Therefore, it is important to prevent burnout particularly among those in leading roles because it may also transmit to colleagues lower in the hierarchy.

### Limitations and suggestions for future research

This study is not without limitations. The first is the cross-sectional study design that does not allow causal inferences. It was not possible to investigate how long it takes for a crossover process to develop or how long-lasting its effects are. Longitudinal and, for example, diary studies are needed to reveal temporal issues in the crossover process. Second, the effect sizes of the moderation effects in this study were low to moderate. However, we could show three-way interaction effects that are rarely reported in the crossover literature. It should also be noted that generally, effect sizes tend to be small in linear interaction analyses (Frazier, Tix, & Barron, 2004).

Third, in this study, we did not investigate the role of common stressors that may explain possible crossover effects. Westman (2001) suggested that the relationship between partners' strain can be spurious if it is the result of common experiences, for example, shared adverse working conditions. However, we found no direct relationship between the working partners' exhaustion, and therefore, it is unlikely that common stressors have had an impact on our findings.

A fourth possible limitation is that the study sample was not particularly highly exhausted. However, exhaustion is a continuous variable, and although the mean levels of exhaustion were not particularly high, some people in our sample scored very high in exhaustion (the range in a 0–6 scale for dental nurses was 0–5.8 and for dentists, 0–6.0, respectively). In addition, the mean levels of dentists (1.72) and nurses' (1.66) exhaustion are higher than the levels of exhaustion among the general population in Finland (1.20 for women and 1.00 for men; Ahola et al., 2006). Nonetheless, it would be interesting to replicate this study in a sample with even more exhausted employees. It could be that crossover is more unlikely from one highly exhausted colleague to another because an exhausted colleague may also have become more cynical, thereby avoidance behaviour rather than positive collaboration would be dominant in the dyad. Another interesting option would be to study whether positive states such as work engagement would cross over under similar conditions.

### Conclusions

Our study showed that exhaustion may cross over particularly from exhausted dentists (leading position) to dental nurses (subordinate position) under conditions of positive and frequent collaboration. Friendliness and mutual feedback protect nurses from exhaustion but may become risk factors for the crossover of exhaustion when the work partner higher in the hierarchy is exhausted and when co-operation is frequent. This paradoxical nature of positive interpersonal relationships is a challenge for dentistry and for healthcare organizations in general. Building early interventions to prevent burnout is worthwhile because it may protect against both individual and socially induced burnout.

### Conflict of interest

The authors declare no conflicts of interests.

### Acknowledgment

This study was supported by the Finnish Work Environment Fund (project no. 110152).

### REFERENCES

- Ahola, K., Honkonen, T., Isometsä, E., Kalimo, R., Nykyri, E., Koskinen, S.,... Lönnqvist, J. (2006). Burnout in the general population. Results from the Finnish Health 2000 Study. *Social Psychiatry and Psychiatric Epidemiology*, 41, 11–17.
- Aiken, L. S., & West, S. G. (1991). Multiple regression: Testing and interpreting interactions. Newbury Park, CA: Sage.
- Arbuckle, J. L. (2005). Amos 6.0 user's guide. Chicago: SPSS Inc.
- Bakker, A. B., & Demerouti, E. (2009). The crossover of work engagement between working couples. A closer look at the role of empathy. *Journal of Managerial Psychology*, 24, 220–236.
- Bakker, A. B., Demerouti, E., & Euwema, M. C. (2005). Job resources buffer the impact of job demands on

- burnout. *Journal of Occupational Health Psychology*, 10, 170–180.
- Bakker, A. B., Le Blanc, P. M., & Schaufeli, W. B. (2005). Burnout contagion among nurses who work at intensive care units. *Journal of Advanced Nursing*, 51, 276–287.
- Bakker, A. B., & Schaufeli, W. B. (2000). Burnout contagion processes among teachers. *Journal of Applied Social Psychology*, 30, 2289–2308.
- Bakker, A. B., & Xanthopoulou, D. (2009). The crossover of daily work engagement: Test of an actor-partner interdependence model. *Journal of Applied Psychology*, 94, 1562–1571.
- Bakker, A. B., Schaufeli, W. B., Sixma, H., & Bosveld, W. (2001). Burnout contagion among general practitioners. *Journal of Social and Clinical Psychology*, 20, 82–98.
- Bakker, A. B., Shimazu, A., Demerouti, E., Shimada, K., & Kawakami, N. (2011). Crossover of work engagement among Japanese couples: Perspective taking by both partners. *Journal of Occupational Health Psychology*, 16, 112–125.
- Bakker, A. B., Van Emmerik, H., & Van Riet, P. (2008). How job demands, resources, and burnout predict objective performance: A constructive replication. *Anxiety, Stress, and Coping*, 21, 1–16.
- Bakker, A. B., Westman, M., & Schaufeli, W. B. (2007). Crossover of burnout: An experimental design. *European Journal of Work and Organizational Psychology*, 16, 220–239.
- Bakker, A. B., Westman, M., & Van Emmerik, I. (2009). Advancements in crossover theory. *Journal of Managerial Psychology*, 24, 206–219.
- Barsade, S. G. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly*, 47, 644–675.
- Bartel, C., & Saavedra, R. (2000). The collective construction of work group moods. *Administrative Science Quarterly*, 45, 197–231.
- Bolger, N., DeLongis, A., Kessler, R. C., & Wethington, E. (1989). The contagion of stress across multiple roles. *Journal of Marriage and the Family*, 51, 175–183.
- Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park: Sage.
- Chang, W., Ma, J., Chiu, H., Lin, K., & Lee, P. (2009). Job satisfaction and perceptions of quality of patient care, collaboration and teamwork in acute care hospitals. *Journal of Advanced Nursing*, 65, 1946–1955.
- Cortina, J. M., Chen, G., & Dunlap, W. P. (2001). Testing interaction effects in LISREL: Examination and illustration of available procedures. *Organizational Research Methods*, 4, 324–360.
- Cowlshaw, S., Evans, L., & McLennan, J. (2011). Work-family conflict and crossover in volunteer emergency service workers. *Work and Stress*, 24, 342–358.
- Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands—Resources model of burnout. *Journal of Applied Psychology*, 86, 499–512.
- Demerouti, E., Bakker, A. B., Schaufeli, W. B. (2005). Spillover and crossover of exhaustion and life satisfaction among dual-earner parents. *Journal of Vocational Behavior*, 67, 266–289.
- Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderation and mediation effects in counseling psychology. *Journal of Counseling Psychology*, 51, 115–134.
- Fritz, C., & Sonnentag, S. (2006). Recovery, well-being, and performance-related outcomes: The role of workload and vacation experiences. *Journal of Applied Psychology*, 91, 936–945.
- Glaser, L., & Einarsen, S. (2006). Experienced affect in leader-subordinate relationships. *Scandinavian Journal of Management*, 22, 49–73.
- Gorter, R. C. (2000). Burnout among Dutch dentists: identification and prevention. Doctoral thesis. Amsterdam, The Netherlands: University of Amsterdam.
- Hackman, J. R., & Oldham, G. R. (1980). *Work redesign*. Reading, Massachusetts: Addison Wesley.
- Haines, V. A., Hurlbert, J. S., & Zimmer, C. (1991). Occupational stress, social support, and the buffer hypothesis. *Work and Occupations*, 18, 212–235.
- Hakanen, J. J., & Lindbohm, M.-L. (2008). Work engagement among breast cancer survivors and their referents: The importance of optimism and social resources at work. *Journal of Cancer Survivorship*, 2, 283–295.
- Hakanen, J., Schaufeli, W. B., & Ahola, K. (2008). The job demands-resources model: A three-year cross-lagged study of burnout, depression, commitment, and work engagement. *Work and Stress*, 22, 224–241.
- Halbesleben, J. R. (2006). Sources of social support and burnout: A meta-analytic test of the conservation of resources model. *Journal of Applied Psychology*, 91, 1134–1145.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1–55.
- Johnson, S. (2009). Do you feel what I feel? Mood contagion and leadership outcomes. *The Leadership Quarterly*, 20, 814–827.
- Kalimo, R., Hakanen, J., & Toppinen-Tanner, S. (2006). Maslachin yleinen työuupumuksen arviointimenetelmä MBI-GS [The Finnish version of Maslach's Burnout Inventory—General Survey]. Helsinki: Finnish Institute of Occupational Health.
- Lavee, Y., & Ben-Ari, A. (2007). Relationship of dyadic closeness with work-related stress: A daily diary study. *Journal of Marriage and the Family*, 69, 1021–1035.
- Lee, R. T., & Ashforth, B. E. (1996). A meta-analytic examination of the correlates of the three dimensions of burnout. *Journal of Applied Psychology*, 81, 123–133.
- Leiter, M. P., Hakanen, J. J., Ahola, K., Toppinen-Tanner, S., Koskinen, A., & Väänänen, A. (in press). Organizational predictors and health consequences of changes in burnout: A 12-year cohort study. *Journal of Organizational Behavior*. DOI: 10.1002/job.1830.
- Maslach, C. (1976). Burned-out. *Human Behavior*, 9, 16–22.
- Maslach, C., & Leiter, M. P. (2008). Early predictors of job burnout and engagement. *Journal of Applied Psychology*, 93, 498–512.
- Mathieu, J. E., Tannenbaum, S. I., & Salas, E. (1992). Influences of individual and situational characteristics on measures of training effectiveness. *Academy of Management Journal*, 35, 828–847.
- Neumann, R., & Strack, F. (2000). Mood contagion: The automatic transfer of mood between persons. *Journal of Personality and Social Psychology*, 79, 211–223.
- Perhoniemi, R., & Hakanen, J. J. (2010). A new measure of kindness at work. Poster presented at the 4th International Seminar of Positive Occupational Health Psychology: Lisbon.
- Poghosyan, L., Clarke, S. P., Finlayson, M., & Aiken, L. H. (2010). Nurse burnout and quality of care: Cross-national investigation in six countries. *Research in Nursing & Health*, 33, 288–298.
- Price, M., & Weiss, M. (2000). Relationship among coach burnout, coach behaviors, and athletes' psychological responses. *The Sport Psychologist*, 14, 391–409.
- Rajah, R., Song, Z., & Arvey, R. (2011). Emotionality and leadership: Taking stock of the past decade of research. *The Leadership Quarterly*, 22, 1107–1119.
- Roelofs, J., Verbraak, M., Keijsers, G. P. J., de Bruin, M. B. N., & Schmidt, A. J. M. (2005). Psychometric properties of a Dutch version of the Maslach Burnout Inventory General Survey (MBI-DV) in individuals with and without clinical burnout. *Stress and Health*, 21, 17–25.
- Schaufeli, W. B. (2007). Burnout in health care. In P. Caravon (Ed.), *Handbook of human factors and ergonomics in health care and patient safety* (pp. 217–232). Mahway, NJ: Lawrence Erlbaum.
- Shirom, A., & Melamed, S. (2006). A comparison of the construct validity of two burnout measures in two groups of professionals. *International Journal of Stress Management*, 13, 176–200.
- Skakon, J., Nielsen, K., Borg, V., & Guzman, J. (2010). Are leaders' well-being, behaviours and style associated with the affective well-being of their employees? A systemic review of three decades of research. *Work and Stress*, 24, 107–139.
- Song, Z., Foo, M., Uy, M., & Sun, S. (2011). Unraveling the daily stress crossover between unemployed individuals and their employed spouses. *Journal of Applied Psychology*, 96, 151–168.
- Sy, T., Cote, S., & Saavedra, R. (2005). The contagious leader: Impact of the leader's mood on the mood of group members, group affective tone, and group processes. *Journal of Applied Psychology*, 90, 295–305.
- Te Brake, J. H., Bouman, A. M., Gorter, R. C., Hoogstraten, J., & Eijkman, M. A. (2008). Using the Maslach Burnout Inventory among dentists: Burnout measurement and trends. *Community Dentistry and Oral Epidemiology*, 36, 69–75.
- Tims, M., Bakker, A. B., & Derks, D. (2012). Development and validation of the job crafting scale. *Journal of Vocational Behavior*, 80, 173–186.
- Totterdell, P., Kellet, S., Teuchmann, K., & Briner, R. (1998). Evidence of mood linkage in work groups. *Journal of Personality and Social Psychology*, 74, 1504–1515.
- Vealey, R., Armstrong, L., Comar, W., & Greenleaf, C. (1998). Influence of perceived coaching behaviors on burnout and competitive anxiety in female college athletes. *Journal of Applied Sport Psychology*, 10, 297–318.
- Westman, M. (2001). Stress and strain crossover. *Human Relations*, 54, 717–751.

- Westman, M. (2011). Editorial: The impact of stress on the individual, the dyads and the team. *Stress and Health, 27*, 177–180.
- Westman, M., & Bakker, A. B. (2008). Crossover of burnout among health care professionals. In J. Halbesleben (Ed.), *Stress and burnout in health care* (pp. 111–125). New York: Nova Sciences.
- Westman, M., & Etzion, D. (1999). The crossover of strain from school principals to teachers and vice versa. *Journal of Occupational Health Psychology, 4*, 269–278.
- Westman, M., Bakker, A. B., Roziner, I., & Sonnentag, S. (2011). Crossover of job demands and emotional exhaustion within teams: A longitudinal multilevel study. *Anxiety, Stress, and Coping, 24*, 561–577.
- Westman, M., Keinan, G., Roziner, I., & Benyamini, Y. (2008). The crossover of perceived health between spouses. *Journal of Occupational Health Psychology, 13*, 168–180.
- Westman, M., Vinokur, A. D., Hamilton, V. L., & Roziner, I. (2004). Crossover of marital dissatisfaction during military downsizing among Russian army officers and their spouses. *Journal of Applied Psychology, 89*, 769–779.
- Zangaro, G. A., & Soeken, K. L. (2007). A meta-analysis of studies of nurses' job satisfaction. *Research in Nursing & Health, 30*, 445–458.