Work–Home Interference and Burnout

A Study Based on Swedish Twins

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Objective: This study sets out to investigate the impact of work–home interference on burnout in women and men, while taking genetic and family environmental factors into account. **Methods:** A total of 4446 Swedish twins were included in the study. The effects of work–home conflict (WHC) and home–work conflict (HWC) on burnout between and within pairs were analyzed with co-twin control analyses. **Results:** Both WHC and HWC were significantly associated with burnout. Genetic factors may be involved in the association between HWC and burnout in women. Familial factors were not involved for WHC and burnout, neither for women nor for men. **Conclusions:** This study shows the importance to encounter WHC per se to prevent burnout. Because of genetic confounding in HWC and burnout in women, preventive efforts may also take into account individual characteristics.

Stress-related health problems, such as burnout, are the main reasons for long-term sickness absence in Sweden today, and are increasing in several Nordic countries.[1] This is particularly evident in women.[2] Yet, our current understanding of risk factors for stress-related health problems in general, and particularly in women, is poor. One explanation for women having a higher risk of stress-related ill-health is attributed to women having a more negative work–life balance than men, but it has also been suggested that biological factors can have an effect.[3] Nevertheless, the mechanism of how work–life balance as well as biological factors is related to burnout needs to be further explored. Therefore, this study sets out to increase the knowledge of how work–home interference (WHI) is related to burnout by taking genetic and early family environmental factors into account. A twin setting allows possibilities to control for genetic and shared environmental factors, such as early family life, as well as sex and age in matched twin pairs, and thereby contributes to clarify the associations investigated. To our knowledge, no previous studies have investigated the impact of WHI on burnout using this kind of design. With further knowledge of the etiology of burnout in women and men, including stressors in terms of WHI as well as demographic and biological factors, preventive efforts can be tailored more effectively.

Work–home interference is a bidirectional construct consisting of work–home conflict (WHC) when the demands of the work role interfere with an individual's ability to perform the private role, and home–work conflict (HWC) when the demands of the private role interfere with an individual's ability to perform the work role.[4,5] Several studies have found main effects of WHI on health outcomes, as well as mediating effects of WHI in associations between work stressors and physical and mental health, including burnout.[5–11] Often defined as a state of emotional exhaustion,[12] burnout has in turn been prospectively associated with a number of negative outcomes such as poor job performance,[13] psychological ill-health,[14] physical ill-health,[15] long-term sickness absence,[16] and all-cause mortality.[17] In addition to various job-related stressors,[18] demographic risk factors are associated with burnout; young people and women tend to be slightly more exhausted than older people and men.[19,20]

Previous twin studies have shown genetic influences for burnout and for coping with professional demands.[21–24] Moreover, studies investigating the influence of familial factors (genetic and shared environmental factors) in associations between stressors and health outcomes have shown that genetic factors contribute to the association between stressful life events and depression,[25] and between unemployment and anxious depression.[23] A recent longitudinal study of developmental trajectories of WHI (conceptualized as work–family conflict) found such conflicts to be fairly stable through life in the sample as a whole and not limited to the early part of employees' working career.[26] Taken together, there are reasons to believe that genetic and shared environmental factors could influence the association between WHI and burnout.

Twin studies make use of the fact that monozygotic (MZ) or identical twins share all of their genetic material, whereas dizygotic (DZ) or fraternal twins share on average 50% of the segregating genes. Differences between MZ twins are therefore likely to reflect environmental effects. Moreover, DZ twins are the perfect comparison of MZ twins as both MZ and DZ twins are most likely influenced by similar early life environments such as socioeconomic status or upbringing that can affect later life outcomes such as occupation. In this study, a co-twin control design of the same-sex twin pairs was used to investigate the impact of WHI on burnout.

The aim of this study was to investigate the association between WHI and burnout in working women and men, while taking genetic and family environmental factors into account with a co-twin control design. Sex, age, education, child responsibility, and job demands were included as covariates as they were supposed to have an impact on WHI and burnout.[18–20,27] On the basis of previous research,[20,27] it was hypothesized that women would experience more WHI and burnout than men. Nevertheless, as previous studies have found few quantitative differences between men and women as regards the influence of genetic and shared environmental factors,[21] it was hypothesized that familial factors would be involved in the same extent for women and men. On the basis of this, the following hypotheses were formulated:

- *Hypothesis 1.* Work–home interference is positively associated with burnout.
- *Hypothesis 2.* Women perceive more WHI and burnout.
- *Hypothesis 3.* Genetic or shared environmental factors affect the association between WHI and burnout.

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- *Hypothesis 4.* Genetic or shared environmental factors affect the association between WHI and burnout in the same extent for women and men

METHOD

Participants

The source population consisted of 25,378 twins from the Swedish Twin Registry who were born between 1959 and 1985 and participated in the Study of Twin Adults: Genes and Environment (STAGE) web-based questionnaire in 2005.[28] This population included various groups, such as students, employed in various sectors and professions, and persons on sick-leave. Because this study investigated the interaction of work and home demands, only data from employed individuals were included. In the multivariate analysis of variance and correlation analyses, 13,730 individuals were included (52% were women). Their age ranged between 19 and 46 years (M = 33). Forty-six percent had children living at home (24% had one child; 52%, two children; 19%, three children; and 5%, four or more children), 15% lived alone, whereas 58% lived with a partner (of which 38% were married) and 27% with friends or own parents. Five percent indicated elementary school as their highest education, 6% vocational school, 43% upper secondary school, and 46% had a university degree (including 6% with a doctorate degree). In this sample, 54% worked in the private sector, 21% in municipality, 9% in the public sector, 7% in the county council and 6% were self-employed, and 3% in other sectors.

The co-twin analyses included 4446 individuals in the complete same-sex twin pairs where both twins had complete data in all variables used in this study. Of these, 2518 were MZ twin pairs and 1928 DZ twin pairs (1342 MZ and 1086 DZ female twins, 1176 MZ and 842 DZ male twins). See Table 1 for details of the numbers of participants and exclusions.

In the STAGE, zygosity determination for the same-sex twin pairs was obtained through questions about childhood resemblance. When validated against serological and microsatellite markers, this method was about 98% accurate.[29]

Measures

Burnout was measured as a state of exhaustion with three items from the Pines Burnout Measure (Pines BM[30]; expressed as the adjectives "feeling depressed," "being emotionally exhausted," and "feeling run down." Answers were given by respondents on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), with higher scores indicating more burnout. Furthermore, the three items of the Pines BM, included in the STAGE and hence available for this study, were chosen as they were found to correlate strongly ($r = 0.90$) with the full 21-item Pines BM.[31] In this study, Cronbach α for the three-item scale was 0.89.

Work–home interference was measured with two questions formulated as "Do the demands in your work affect your home and family life in a negative way" (WHC) and "Do the demands in your home/your family affect your work in a negative way" (HWC). These items were originally developed for the General Nordic Questionnaire for psychological and social factors at work[32] and were answered on a four-point Likert scale ranging from 1 (always) to 4 (never). These items were reversed so that high scores indicate more conflicts.

Age, sex, level of education, child responsibility, and job demands were included as covariates in the analyses. Age was analyzed as a continuous variable and the variable child responsibility was measured as a dichotomous variable, stating whether the participant had children living at home. Education, as an indicator of socioeconomic status, was measured on a six-point scale but categorized into a three-point categorical scale indicating their highest education level: 1, elementary school; 2, vocational school; and 3, university degree (military school and vocational university were included in the category 3 and residential college for adult education in the category 2). The Swedish translation[33] of Karasek and Theorell's[34] measure was used to assess job demands, as expressed, for example, by "Does your job require too great a work effort?" Responses were given on a four-point Likert scale, so as to refer to 1 (do not agree) to 4 (agree entirely). In this study, Cronbach α for the five-item scale was 0.64. Genetic and shared environmental factors were controlled for as the study sample consisted of MZ and DZ twin pairs.

TABLE 1. Numbers of Twins in the Source Population of Working Twins and Formation of Study Group for Different Analyses*

Twins	Exclusions
Source population ($n = 25{,}378$)	Nonworking individuals ($n = 4449$)
	Missing values in burnout ($n = 3107$)
	Missing values in WHI and covariates ($n = 3376$)
	Unknown zygosity ($n = 716$)
Descriptive analyses ($n = 13{,}730$)	Opposite sex twins ($n = 7883$)
	No possibility to form within-twin mean values and differences for WHI and burnout due to missing values in either twin ($n = 1401$)

*A total of 4446 twin individuals in complete pairs available for co-twin analysis: 2518 monozygotic and 1928 dizygotic same sex.
WHI, work–home interference.

Statistical Analyses

First, in the cohort sample of 13,730 individuals, potential differences in women and men as regards the included variables with multivariate analysis of variance were analyzed and Pearson correlation coefficients were calculated for associations between the variables. As the variables child responsibility and education were dichotomous and trichotomous, chi-squared statistics was used to test for sex differences and Spearman correlations to analyze correlations. To analyze the impact of age, sex, education, child responsibility, and job demands, these variables were included in model fit statistics comparing models with and without the different covariates.

The co-twin control analyses were performed in the complete same-sex twin pairs according to the acknowledged procedure in the co-twin control design.[35,36] First, two models were compared according to recommendations by Carlin and colleagues[35] calculating the main effects of WHC and HWC, respectively, on burnout with linear mixed model analysis in the complete sample (Model 1, B_C) not acknowledging co-twin scores, making the results comparable to a nontwin sample. In Model 2, the effects of WHC and HWC on burnout between pairs (B_B) and within pairs (B_W) were analyzed, indicating the presence of familial factors in the associations. The goodness-of-fit of the different model specifications, comparing Model 1 and Model 2 and excluding and including the different covariates, was tested by likelihood ratios, supplemented with the Akaike's information criterion. On the basis of these model specification tests, the subsequent co-twin control analyses based on Model 2 were performed stratified on sex and zygosity. A significance test for differences between MZ and DZ twins was performed with Wald's test.

The between-pair variable was calculated as the mean level of WHC and HWC, respectively, of the twin pairs and the within-pair variable as each twin's value difference from the pair mean. The within-pair effect is by design matched for all shared environmental and genetic factors (100% for MZ pairs, and on average 50% for DZ pairs). The interpretation of the co-twin analyses involves comparisons of the within- and between-pair effects ($B_B - B_W$) to encounter

the presence of familial factors as well as comparisons between the MZ and DZ pairs to evaluate whether shared environmental or genetic factors account for the effect. A significant within-pair effect represents an association that is not confounded by factors shared by the two twins in a pair.[35–37] Nevertheless, if the between-pair effect differs significantly from the within-pair effect, factors shared by the two twins in a pair are involved in explaining the association. Moreover, if the between- and within-pair effects differ similarly in MZ and DZ twins, shared environmental factors are supposed to be more significantly involved than genetics.[35,38,39] The IBM SPSS 20.0 (IBM Inc, Chicago, IL) and Stata 12.0 packages (StataCorp LP, College Station, TX) were used for the statistical analyses.

The study was approved by the Regional Ethical Review Board in Stockholm, Sweden.

RESULTS

Correlation analyses (Table 2) showed that all the included variables (except burnout with age, children, and education for women and burnout with age for men) were significantly correlated, albeit on a fairly low level. Multivariate analysis of variance showed, partly in line with hypothesis 2, that women perceived more WHC ($F = 25.9_{1,13711}$; $P < 0.001$) and burnout ($F = 679.4_{1,13711}$; $P < 0.001$), but there was no difference in HWC between men and women ($F = 0.45_{1,13711}$; $P > 0.05$). Women had higher educational degrees ($\chi^2 = 208.73$; $P < 0.001$), and more women than men had children living at home ($\chi^2 = 285.64$; $P < 0.001$).

Linear mixed model analyses reported in Table 3 showed, in line with hypothesis 1, that there were significant effects of WHC and HWC on burnout. Model testing with and without the covariates age, education, child responsibility, and job demands included showed that there was no significant difference between the compared models (likelihood ratio test, $P < 0.05$). These covariates were therefore not included in the subsequent analyses. Nevertheless, as opposed to hypothesis 4 stating that there would be no sex differences as regards the influence of familial factors, model fit statistics comparing models with and without sex indicated an importance of sex (likelihood ratio test, $P < 0.001$). The following analyses were therefore stratified for men and women. Furthermore, as shown in Table 3, there were significant differences for the between- and within-pair effects for HWC, indicating that familial factors may be involved in the association between HWC and burnout, and that Model 2 better account to the data than Model 1. Moreover, model fit statistics also showed that Model 2, including between- and within-pair effects, fit data better than Model 1 (likelihood ratio test, $P < 0.001$). Thus, the subsequent co-twin analyses were focused on Model 2 and stratified by sex and zygosity (Table 4).

The results from the stratified co-twin analyses showed that familial factors may not be involved in the association between WHC and burnout (Table 4). Nevertheless, as regards HWC and burnout, there was a significant difference for between- and within-pair effects for MZ women, suggesting that familial factors may be involved in the association between HWC and burnout. Wald's test showed that the between- and within-pair effects differed in DZ and MZ twins

TABLE 2. Pearson Correlations and Mean Values (Standard Deviations)[a] in a Cohort of Swedish Twins ($n = 13{,}730$ Individuals)[b]

	Mean Values (SD)			Correlations (Men Above and Women Below Diagonal)					
	Men	Women	WHC	HWC	Burnout	Age	SES[c]	Child	JD
WHC	2.06 (0.98)[d]	2.14 (0.98)[d]	1	0.53**	0.33**	0.11**	0.13**	0.10**	0.40**
HWC	1.62 (0.80)	1.62 (0.81)	0.46**	1	0.26**	0.14**	0.13**	0.17**	0.26**
Burnout	2.16 (1.12)[d]	2.70 (1.3)[d]	0.38**	0.30**	1	0.02***	0.06**	0.05**	0.22**
Age	33.5 (7.68)	33.2 (7.71)	0.11**	0.14**	0.01***	1	− 0.08**	0.50**	0.09**
SES[e]	2.35 (0.60)[d]	2.47 (0.60)[d]	0.13**	0.07**	0.01***	–	1	0.06**	0.06**
Child[e]	40%[d]	51%[d]	0.07**	0.19**	0.03***	0.54**	0.07**	1	0.08**
JD	2.72 (0.01)	2.70 (0.01)	0.42**	0.20**	0.22**	0.07*	0.11**	0.02***	1

*$P < 0.05$; **$P < 0.001$; ***not significant.

[a]For child responsibility, the percentage having children living at home is noted instead of the mean value as this is a dichotomous variable.

[b]Values above the diagonal are correlations for men, and values below are for women.

[c]SES refers to the education level.

[d]Significant difference between men and women ($P < 0.001$) calculated with MANOVA and chi-squared test (SES and child responsibility).

[e]Correlations calculated with the nonparametric Spearman test.

HWC, home–work conflict; JD, job demands; MANOVA, multivariate analysis of variance; SD, standard deviation; SES, socioeconomic status; WHC, work–home conflict.

TABLE 3. Linear Mixed Model Analyses, β-Coefficients With 95% Confidence Intervals, of the Association Between Work–Home Conflict and Home–Work Conflict and Burnout ($n = 4446$ Individuals in Complete Twin Pairs)[a]

	Model 1		Model 2					
	B_C	CI (95%)	B_B	CI (95%)	B_W	CI (95%)	$B_B - B_W$	CI (95%)
WHC	0.40**	0.36–0.44	0.34**	0.20–0.47	0.36**	0.31–0.41	− 0.02***	−0.17–0.12
HWC	0.18**	0.13–0.23	0.34**	0.19–0.50	0.13**	0.06–0.19	0.22*	0.03–0.41

*$P < 0.05$; **$P < 0.001$; ***not significant.

[a]Model 1 refers to the complete sample not acknowledging co-twin scores (B_C) and Model 2 between (B_B) and within pairs (B_W) as well as the difference of between- and within-pair effects ($B_B - B_W$).

B_B, between-pair effect; B_W, within-pair effect; $B_B - B_W$, difference of between- and within-pair effects; CI, confidence intervals; HWC, home–work conflict; WHC, work–home conflict.

TABLE 4. Linear Mixed Model Analyses Between and Within Pairs, β-Coefficients With 95% Confidence Intervals, of the Associations Between Work–Home Conflict and Home–Work Conflict and Burnout Stratified by Sex and Zygosity ($n = 4446$ Individuals in Complete Twin Pairs)

	B_B	CI (95%)	B_W	CI (95%)	$B_B - B_W$	CI (95%)
WHC						
All						
Women ($n = 2428$)	0.27**	0.09–0.45	0.39***	0.31–0.47	− 0.13****	− 0.33–0.08
Men ($n = 2018$)	0.35***	0.18–0.53	0.32***	0.25–0.39	0.03****	− 0.17–0.23
MZ						
Women ($n = 1342$)	0.19****	− 0.04–0.43	0.36***	0.26–0.46	− 0.16****	− 0.43–0.11
Men ($n = 1176$)	0.30*	0.07–0.54	0.32***	0.22–0.41	− 0.01****	− 0.28–0.25
DZ						
Women ($n = 1086$)	0.37**	0.09–0.64	0.44***	0.32–0.56	− 0.07****	− 0.40–0.26
Men ($n = 842$)	0.41**	0.14–0.67	0.32***	0.21–0.43	0.09****	− 0.22–0.39
HWC						
All						
Women ($n = 2428$)	0.50***	0.28–0.71	0.12**	0.04–0.21	0.37**	0.11–0.64
Men ($n = 2018$)	0.22*	0.02–0.43	0.13**	0.04–0.22	0.09****	− 0.17–0.35
MZ						
Women ($n = 1342$)	0.61***	0.33–0.89	0.12*	0.01–0.23	0.50**	0.15–0.84
Men ($n = 1176$)	0.31*	0.02–0.59	0.08****	− 0.03–0.18	0.23****	− 0.11–0.57
DZ						
Women ($n = 1086$)	0.33*	0.00–0.67	0.13****	− 0.01–0.28	0.20****	− 0.22–0.62
Men ($n = 842$)	0.09****	− 0.22–0.39	0.21**	0.06–0.35	− 0.12****	− 0.52–0.28

*$P < 0.05$; **P < 0.01; ***P < 0.001; ****not significant.

B_B, between-pair effect; B_W, within-pair effect; $B_B - B_W$, difference of between- and within-pair effects; CI, confidence intervals; DZ, dizygotic; HWC, home–work conflict; MZ, monozygotic; WHC, work–home conflict.

($P < 0.01$), suggesting that genetic rather than shared environmental factors are involved in the associations. This means that hypothesis 3 was partly supported.

DISCUSSION

This study investigated the association between WHI and burnout, while taking genetic and shared environmental factors into account. In line with previous research,[6,7,9] and according to the first hypothesis, main effects were found for both HWC and WHC on burnout, even after control for various covariates, suggesting that interference between demands in work and at home is an important factor for burnout.

The model fit comparisons showed that the covariates age, education, job demands, and child responsibility were not strongly involved either for WHC and burnout or for HWC and burnout, suggesting that for instance older and younger participants, and participants with and without children living at home, were as much affected by WHC and HWC in terms of burnout. This is in parallel to a longitudinal study by Rantanen and colleagues[26] showing that WHI was not limited to the early part of employees' working career or to employees with small children. Home demands could, for instance, include taking care of older parents, suggesting that WHI is a better label than work–family interference in this context.

Nevertheless, these study results showed that sex had an impact on the level of WHI and burnout as well as in the extent genetic and shared environmental factors affect the associations between WHI and burnout. Even though women and men seem to perceive similar levels of WHI, indicating that these results should be treated with caution, the significant differences that were found, and thus partly support the second hypothesis in this study, are in line with previous studies,[20,27] showing that women perceive more burnout as well as slightly more WHC than do men, but not more HWC. One explanation for women scoring higher on burnout has been attributed to women having a higher total workload and that they are exposed to more stressors than men, but also the fact that women experience more conflicts in combining domestic and paid work than men do.[3] Indeed, the small but significant difference in WHC indicates that women perceive more conflicts with work demands (such as thinking about work at home and overtime work) affecting their possibility to perform home duties (such as preparing dinner and taking care of children or parents). This could perhaps be attributed to traditional gender role patterns, such as home duties to a higher extent being the main responsibility for women, which, in turn, may contribute to higher demands put on women to perform and be present in the home domain. Research shows that women typically spend more time in their home role than men do, regardless of the amount of time they spend on work.[40] The conflict of home demands interfering with work (HWC) did not differ between women and men, which is in line with previous studies.[27,41,42] As found in other studies,[42] both men and women in this study perceive a higher interference of work demands on home duties than home demands on work tasks. This may be interpreted as a consequence of the increasing boundaryless work in which it is possible to work at any time and at any place.[43] Taken together, these results suggest that potential differences between men and women may be of value to include in preventive efforts as well as in future research of WHI and burnout.

Factors shared by twins were hypothesized to be involved in the associations between WHI and burnout. This was based on previous studies, which have found that genetic components are involved in perceived demands[24] and burnout[21,23] and that familial factors are found to be involved in the associations between stressors and health.[25] The co-twin analyses in this study show that familial factors may be involved in the association between HWC and burnout, and stratification on sex shows that this result seems to be driven by

MZ women. Factors shared by female co-twins therefore seem to be more involved in the association between home demands interfering with work and burnout symptoms compared with the impact of work interfering with home duties and its effect on burnout symptoms. Moreover, the results suggest that genetic factors may account for this confounding to a higher extent than family environment as the between- and within-pair differences differed in MZ and DZ women. This could be explained by personality traits such as neuroticism or coping behavior, shown to be heritable,[22,44] being involved in women in a higher extent than for men. In this matter, a neurotic disposition could contribute to more negative emotions in a situation with demands at home interfering with demands at work, which may lead to burnout symptoms. Taken together, these twin analyses partly support hypothesis 3 in so that biological factors are involved in the association between HWC and burnout but reject hypothesis 4 as there indeed seems to be sex differences in the influence of familial factors.

As regards the association between WHC and burnout, this study showed that familial factors were not significantly involved. Moreover, as age, education, children living at home, and job demands did not affect this association, this suggests that the association between WHC and burnout is rather direct and not affected by these factors. Even though other factors could possibly affect WHC and its impact on burnout, such as partners' employment status and the importance of work and family roles to the individual, these results underscore the utility for employers to improve employees' WHC per se to reduce burnout and possibly other stress-related ill-health. Nevertheless, as others have suggested, it is also important for the employees themselves to develop self-regulation strategies to encounter negative spillover of work at home, such as not working from home.[45,46] As women perceive more WHC than men, this may be particularly important in female employees.

A limitation in this study is the cross-sectional design that limits conclusions of the direction of the associations. Also, the single-item measures available in the twin data and used to measure WHI may possibly not capture the complete and complex construct of work interfering with the domestic domain. Nevertheless, the single items used in this study are well-established and validated measures.[32] The main strength of the study is that the magnitude of the associations between WHI and burnout is clarified by the sophisticated co-twin control design, in which it is possible to control for genetic and shared environmental factors as well as sex and age in matched twin pairs. Future behavior genetic studies could focus on the association between work–family interference and burnout over time, including personality characteristics as potential moderating variables. Also, elaboration on a possible moderating effect of WHI on the genetic and environmental influences on burnout could further increase the understanding of the relation between WHI and burnout.

CONCLUSIONS

The present results show that both WHC and HWC are significantly associated with burnout, and that these associations are not affected by age, education, job demands, or children living at home. Women perceive more burnout and slightly more negative interference of work demands on the home domain but not more interference of home demands on work duties. Co-twin analyses point to rather direct associations being present between WHC and burnout but a confounding of genetic factors in HWC and burnout in women. On the basis of this, by providing knowledge of the mechanisms of WHI and burnout, this study underscores the utility for employers to improve employees', in particular women's, WHC per se to reduce burnout. It is also important for the employees themselves to develop self-regulation strategies to encounter negative spillover of work at home, such as not working from home, which is increasingly prevalent in today's boundaryless work life. Moreover, because of genetic confounding in HWC and burnout for women, it is of significance to take into account women's individual characteristics to reduce burnout.

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REFERENCES

1. Järvisalo J, Andersson B, Boedeker W, Houtman I. *Mental Disorders as a Major Challenge in Prevention of Work Disability*. Helsinki: Kela; 2005.
2. *Swedish National Board of Health and Welfare*. Folkhälsorapport 2009 [Swedish National Report on Public Health 2009].
3. Lundberg U. Stress hormones in health and illness: the roles of work and gender. *Psychoneuroendocrinology.* 2005;30:1017–1021.
4. Greenhaus JH, Allen TD, Spector PE. Health consequences of work–family conflict: the dark side of the work–family interface. In: Ganster DC, Perrewe PL, eds. *Research in Occupational Stress and Well-being*. Amsterdam: JAI Press; 2006:171–211.
5. Frone MR, Russell M, Cooper ML. Antecedents and outcomes of work-family conflict: testing a model of the work-family interface. *J Appl Psychol.* 1992;77:65–78.
6. Bacharach SB, Bamberger P, Conley S. Work-home conflict among nurses and engineers: mediating the impact of role stress on burnout and satisfaction at work. *J Org Behav.* 1991;12:39–53.
7. Lambert E, Hogan N. Work-family conflict and job burnout among correctional staff. *Psychol Rep.* 2010;106:19–26.
8. Magee CA, Stefanic N, Caputi P, Iverson DC. The association between job demands/control and health in employed parents: the mediating role of work-to-family interference and enhancement. *J Occup Health Psychol.* 2012;17:196–205.
9. Peeters MCW, Montgomery AJ, Bakker AB, Schaufeli WB. Balancing work and home: how job and home demands are related to burnout. *Int J Stress Manag.* 2005;12:43–61.
10. Voydanoff P. Linkages between the work-family interface and work, family, and individual outcomes—an integrative model. *J Fam Issues*. 2002;23:138–164.
11. Carlson DS, Kacmar KM. Work-family conflict in the organization: do life role values make a difference? *J Manag*. 2000;26:1031–1054.
12. Pines AM. Burnout: an existential perspective. In: Schaufeli WB, Maslach C, Marek T, eds. *Professional Burnout: Recent Developments in Theory and Research*. Washington, DC: Taylor & Francis; 1993:33–51.
13. Wright T, Cropanzano R. Emotional exhaustion as a predictor of job performance and voluntary turnover. *J Appl Psych*. 1998;83:486–493.
14. McManus I, Winder B, Gordon D. The causal links between stress and burnout in a longitudinal study of UK doctors. *Lancet*. 2002;359:2089–2090.
15. Melamed S, Shirom A, Toker S, Berliner S, Shapira I. Burnout and risk of cardiovascular disease: evidence, possible causal paths, and promising research directions. *Psychol Bull*. 2006;132:327–353.
16. Hallsten L, Voss M, Stark S, Josephson M. Job burnout and job wornout as risk factors for long-term sickness absence. *Work*. 2011;38:181–192.
17. Ahola K. Burnout as a predictor of all-cause mortality among industrial employees: a 10-year prospective register-linkage study. *J Psychosom Res.* 2010;69:51–57.
18. Schaufeli W, Leiter M, Maslach C. Burnout: 35 years of research and practice. *Career Dev Int*. 2009;14:204–220.
19. Brewer E, Shapard L. Employee burnout: a meta-analysis of the relationship between age or years of experience. *Hum Resource Dev Rev.* 2004;3:102–123.
20. Purvanova R, Muros J. Gender differences in burnout: a meta-analysis. *J Vocat Behav.* 2010. doi:10.1016/j.jvb.2010.04.006.
21. Blom V, Bergström G, Hallsten L, Bodin L, Svedberg P. Genetic susceptibility to burnout in a Swedish twin cohort. *Eur J Epidemiol.* 2012;27:225.
22. Kozak B, Strelau J, Miles JNV. Genetic determinants of individual differences in coping styles. *Anxiety Stress Coping.* 2005;18:1–15.
23. Middeldorp CM, Cath DC, Boomsma DI. A twin-family study of the association between employment, burnout and anxious depression. *J Affect Disord.* 2006;90:16.

24. Maas H, Spinath PA. Personality and coping with professional demands: a behavioral genetics analysis. *J Occup Health Psychol.* 2012;17:376–385.
25. Kendler KS, Kessler RC, Walters EE, et al. Stressful life events, genetic liability, and onset of an episode of major depression in women. *Am J Psychiatry.* 1995;152:833–842.
26. Rantanen J, Kinnunen U, Pulkkinen L, Kokko K. Developmental trajectories of work–family conflict for Finnish workers in midlife. *J Occup Health Psychol.* 2012;17:290–303.
27. McElwain AK, Korabik K, Rosin HM. An examination of gender differences in work-family conflict. *Can J Behav Sci.* 2005;37:283–98.
28. Lichtenstein P, Sullivan PF, Cnattingius S, et al. The Swedish Twin Registry in the third millennium: an update. *Twin Res Hum Genet.* 2006;9:875–882.
29. Lichtenstein P, De Faire U, Floderus B, Svartengren M, Svedberg P, Pedersen NL. The Swedish Twin Registry: a unique resource for clinical, epidemiological and genetic studies. *J Intern Med.* 2002;252:184–205.
30. Pines AM, Aronson E, Kafry D. *Burnout: From Tedium to Personal Growth*. New York: The Free Press; 1981.
31. Hallsten L, Josephson M, Torgén M. Performance-based self-esteem: a driving force in burnout processes and its assessment. *Arbete & Hälsa/Work & Health*. Stockholm: Arbetslivsinstitutet/National Institute for Working Life; 2005:1–35.
32. Dallner M, Lindström K, Elo A-L, et al. Användarmanual för QPSNordic: frågeformulär om psykosociala och sociala faktorer i arbetslivet utprovat i Danmark, Finland, Norge och Sverige. In *Arbetslivsinstitutet, Arbetslivsrapport* 2000.
33. Sanne B, Torp S, Mykletun A, Dahl AA. The Swedish Demand-Control-Support Questionnaire (DCSQ): factor structure, item analyses, and internal consistency in a large population. *Scand J Public Health.* 2005;33:166–174.
34. Karasek R, Theorell T. *Healthy Work: Stress, productivity and the Reconstruction of Working Life*. New York: Basic Books; 1990.
35. Carlin JB, Gurrin LC, Sterne JA, Morley R, Dwyer T. Regression models for twin studies: a critical review. *Int J Epidemiol.* 2005;34:1089–1099.
36. Dwyer T, Morley R, Blizzard L. Twins and fetal origins hypothesis: within-pair analyses. *Lancet.* 2002;359:2205–2206.
37. Gurrin LC, Carlin JB, Sterne JA, Dite GS, Hopper JL. Using bivariate models to understand between- and within-cluster regression coefficients, with application to twin data. *Biometrics.* 2006;62:745–751.
38. Begg MD, Parides MK. Separation of individual-level and cluster-level covariate effects in regression analysis of correlated data. *Stat Med.* 2003;22:2591.
39. Wennerstad KM, Silventoinen K, Tynelius P, Bergman L, Kaprio J, Rasmussen F. Associations between IQ and cigarette smoking among Swedish male twins. *Soc Sci Med.* 2010;70:575–581.
40. Krantz G, Lundberg U. Workload, work stress, and sickness absence in Swedish male and female white-collar employees. *Scand J Public Health.* 2006;34:238–246.
41. Eagle BE, Miles EW, Icenogle ML. Interrole conflicts and the permeability of work and family domains: are there gender differences? *J Vocat Behav.* 1997;50:168–184.
42. Kinnunen U, Mauno S. Antecedents and outcomes of work-family conflict among employed women and men in Finland. *Human Relat.* 1998;51:157–177.
43. Bellavia G, Frone MR. Work-family conflict. In:Barling J, Kelloway EK, Frone MR, eds. *Handbook of Work Stress*. Thousand Oaks, CA: Sage; 2005:143–162.
44. Viken RJ, Rose RJ, Kaprio J, Koskenvuoo M. A developmental genetic analysis of adult personality: extraversion and neuroticism from 18 to 59 years of age. *J Pers Soc Psychol*. 1994;66:722–730.
45. Ten Brummelhuis LL, Bakker AB. A resource perspective on the work-home interface: The work-home resources model. *Am Psychol*. 2012;67:545–556.
46. Grawitch MJ, Barber LK, Justice L. Re-thinking the work-life interface: It's not about balance, it's about resource allocation. *Appl Psychol*. 2010;2:127–159.

