A longitudinal study exploring the relationships between occupational stressors, non-work stressors, and work performance

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Abstract
There is a lack of intricate research into the relationships between work performance and other variables. This study examined the causal relationship between work, non-work stressors, and work performance. Using longitudinal multi-group data from three groups—university staff, trainee nurses, and part-time employees (overall $N = 244$)—structural equation modelling was employed to explore one-way and reverse competing models. The results produced a good fitting model with one-way causal paths from work-related and non-work stressors (time 1) to job performance (time 2). Nested model comparison analysis provided further evidence to support this best fitting model, emphasizing the strong influence that non-work factors have within the workplace. This study has important implications for theory, methodology and statistical analysis, and practice in the field of work-related stressors and performance.

Keywords: *Stressors, non-work stressors, performance, structural equation modelling, longitudinal, work-related stress*

Introduction

Over the past four decades, significant changes have occurred within the workplace. The increase in information communication technology, the globalization of many industries, company restructuring, and changes in job contracts and workplace patterns have all contributed to the transformation of the nature of work (Sparks, Faragher, & Cooper, 2001). Jones, Huxtable, Hodgson, and Price (2003) estimated that up to 5 million British employees felt "very" or "extremely" stressed by their work. They estimated that on average each person affected took 28.5 days off work per year and that stress, depression, or anxiety was the second most prevalent type of work-related ill-health after musculo-skeletal disorders.

Considering the above, studies over the years investigating the causal relationship between stressors and job performance are much rarer than one would expect (e.g., Edwards & Rothbard, 1999; Hart, 1999; Jamal, 1984, 1985; Jex, 1998; Motowidlo, Packard, & Manning, 1986; Spector, Dwyer, & Jex, 1988; Van Dyne, Jehn, & Cummings, 2002). This association would appear to be important from both an employer and employee

perspective, as organizational success is vital. These issues have been raised by a number of authors in the field (Campbell, 1990; Fried, Ben-David, Tiegs, Avital, & Yeverechyahu, 1998; Frone, Russell, & Cooper, 1992; Jackson & Schuler, 1985; Korsgaard, Meglino, & Lester, 2004). The current research therefore examines the causal structure between work and non-work stressors and work performance, as it has both theoretical and practical implications. For example, organizations can improve attempts to anticipate problems related to work performance (such as work and non-work stressors), develop particular interventions to assist employees who experience difficulties, and explore the effects experienced by employees who juggle multiple roles in life (between work and non-work life domains).

The relationship between stress and performance has been investigated for nearly 100 years. However, the direction of this association has produced disagreement. According to Sullivan and Bhagat (1992) there are four main hypotheses regarding the association between stressors and work performance. The first model suggests that performance is greater when only moderate amounts of stressors are apparent as opposed to low amounts of stressors. The second hypothesis claims that stressors and work performance have a positive linear relationship that associates stressors with ''challenge'' (Meglino, 1977). For example, low levels of stressors result in low performance, whereas high levels of stressors result in high performance. Examples of studies that support this theory are Arsenault and Dolan (1983) and Kahn and Long (1988). The third hypothesis considers that stressors and work performance have a negative linear relationship in that high levels of stressors are related to low performance. Stressors are seen to distract employees from their work, which consequently diminishes performance (see, for example, Iaffaldano & Muchinsky, 1985; Motowidlo et al., 1986; Siu, 2003). The fourth model argues that there is no association between stressors and performance (see Matteson, Ivancevich, & Smith, 1984; Orpen & Welch, 1989).

An alternative model, although similar to the previously mentioned models, suggest that there is a curvilinear relation between stressors and performance (the inverted-U theory). This theory that originates from the activation theory of motivation argues that low levels of stressors initially increase performance but an optimum is then reached after which increased stressor levels negatively affect performance. Warr's (1987) vitamin model linking stressors and well-being is a further example of a non-linear hypothesis. However, findings have led to the conclusion that this theory is not valid (Neiss, 1988; Westman & Eden, 1991), since only two studies have supported the U-inverted theory (Anderson, 1976; Srivastava & Krishna, 1991). Jamal (1984, 1985) examined all the aforementioned models and found in both studies a negative linear relationship supporting hypothesis three. The vast majority of empirical results within the literature appear to support this negative association (e.g., Allen, Hitt, & Greer, 1982; Greer & Castro, 1986; Iaffaldano & Muchinsky, 1985; Westman & Eden, 1991, 1996). The current study nevertheless suggests that these hypotheses are overall perhaps too simplistic in that they fail to adequately consider more complex transactional relationships between stressors and work performance. These include one-way causal patterns in which work and non-work stressors predict work performance, and the reverse patterns in which work performance predicts work and non-work stressors.

For reasons of brevity, the current study will not provide an exhaustive theoretical discussion of previous research that investigates the relationship between stressors and work performance. Instead, a selective run down of the most appropriate studies that are directly related to the present study that examine the causal relationship between work stressors and

work performance will be given. For example, a study by Jex (1998) revealed that the association between work stressors (interpersonal conflict) and performance was not particularly strong; however this same association was found to be strong in a study by Barnes, Potter, and Fiedler (1983). Jex (1998) nevertheless discovered in different groups that workload can have both a positive and negative relationship with performance, e.g., high levels of stressors influence both high and low levels of job performance (the current research will also measure both workload and work performance). Alternatively, Motowidlo et al. (1986) in a study of nurses consistently found a negative relationship between workplace stressors and performance. Iaffaldano and Muchinsky (1985) and Steen, Firth, and Bond (1998) reported similar findings using nursing samples. (The current study also incorporates a nursing sample.) More recently, Siu (2003), in a study among employees in Hong Kong, again found that job stressors and self-rated job performance were negatively related.

Warr (1987) put forward the idea that work and non-work domains of life are important features within the stressors process. Furthermore, they suggested that "Job and non-job factors are inter-correlated and mutually interactive" (Warr, 1987, p. 75), which seemed to be supported empirically by correlations of between $-.32$ and $-.46$ between negative carry-over (work to home) and non-job affective well-being, respectively, and correlations of around .28 between non-job competence and work-related affective well-being (Warr, 1990, p. 201). This concept has also been elaborated by other authors (for instance, Edwards & Rothbard, 1999; Hart, 1999). Although there has been little research examining the relationships between workplace stressors, work performance, and also non-work stressors, an interesting study by Van Dyne et al. (2002) did investigate these associations. Findings unexpectedly showed that greater levels of workplace stressors predicted greater levels of work performance. Similar findings were obtained by Friend (1982). However, in their study greater levels of non-work stressors were found to predict low levels of work performance. Van Dyne et al. (2002), and Friend (1982), both suggest that future research should be performed on alternative samples in order to generalize these findings. A meta-analysis of previous studies was performed by Kossek and Ozeki (1999) that found overall that work–family conflict was consistently negatively related to work performance and positively associated with family-related absence from work. A possible explanation for the effects of non-work stressors on work performance has been provided by Farr and Ford (1990). They suggest that stressors experienced outside the workplace can help people direct attention to their performance at work. The underlying process at work is that stressors at home can influence performance at work in both a positive and negative way. Job performance has obviously been measured within a workplace context, where associations between job stressors have been investigated. However, there is no evidence of more intricate and complex research exploring the relationships between work performance and other variables such as stressors across both work and non-work contexts.

More interestingly, there is little research within the literature investigating the reverse association between stressors and work performance testing the hypothesis that work performance influences stressor experience. Reviews of transactional models of stress (e.g., Cox, 1993) provide the theoretical grounding of the current study where "the person and the environment are viewed as being in a dynamic, mutually reciprocal, bidirectional relationship" (Folkman, Lazarus, Gruen, & DeLongis, 1986, p. 572). In essence, this view allows positive outcomes in relation to perceived work performance to feed back into greater levels of perceived control and/or coping efficacy, which may reduce the psychological impact of future stressful encounters in either the work or the non-work domains. An

understanding of the reverse influence of work performance on the appraisal of both work and non-work stressors would provide organizations with valuable information. For example, this hypothesis suggests that greater employee performance, which in itself can influence productivity, can also reduce the effects of both work and non-work stressors.

A possible alternative reasoning may be that performing well increases self-confidence, which then affects the appraisal of stressors. Stressors are therefore considered as less threatening. Work conducted by Lazarus and Folkman (1984) offers the theoretical grounding of the current study, for which a two-way reciprocal transactional basis is the framework. Similarly, work performed by Karasek and Theorell (1990) may also provide an explanation for the effect of performance on the appraisal of stressors. For example, the demand-control-support model suggests that greater levels of learning (increased performance) can reduce strain.

Since there is not yet a consensus on the association between stressors and performance, which is pivotal for both theory and practice (Jex, 1998; Netemeyer, Boles, & McMurrian, 1996), the aim of the present research was to investigate an alternative proposition that stressors experienced by individuals as a result of fulfilling multiple roles (both at work and outside of work) will consequently impact upon their work performance. This proposition builds upon previous research by exploring the organizational consequences (work performance) of interaction at the work/non-work interface. The reverse proposition is that the work performance experience of individuals will influence the stressor levels that they experience both at work and outside work.

Over the years there has been limited research into work-related stress using longitudinal methodology. A longitudinal design aims to address the methodological limitations related to cross-sectional studies, such as the problem of reverse causation (De Lange, Taris, Kompier, Houtman, & Bongers, 2003; Zapf, Dormann, & Frese, 1996). Causal inferences can be made more plausible by using longitudinal data, for instance by excluding reversed causal associations (Zapf et al., 1996).

Zapf et al. (1996) revealed that at the time of their review only 43 longitudinal studies existed out of hundreds of publications on stress research over nearly four decades. Similarly, only 21 out of 312 studies reviewed by Judge, Thoreson, Bono, and Patton (2001) were longitudinal. Clearly, the additional complexities of longitudinal design and analysis have limited research examining the causal relationships between stressors and performance. However, it is also clear that such research is important and may be classified alongside the job satisfaction–job performance research in its significance (Campbell, 1990; Frone et al., 1992). Zapf et al. (1996) and Beehr, Jex, Stacey, and Murrey (2000) recommend that further longitudinal studies in the field of organizational stress research are required, as this methodology will allow the examination of the causal relationship between work-related stress and work performance over time. Zapf et al.'s (1996) list of methodological recommendations for conducting longitudinal research in organizational stress research has been upheld within the current study.

In the present study the causal structure between measures will be tested using cross-lagged analysis on longitudinal data (Campbell & Stanley, 1963). Cross-lagged techniques are especially applicable where measurements have been taken on the same sample and the same variables at two different times. The use of these methodological and statistical techniques appears to be appropriate in the current research.

Clarification of the associations between work performance and experienced stressors is increasingly important as organizations are being persuaded to develop interventions for minimizing harm (Cousins, Mackay, Clarke, Kelly, Kelly, & McCaig, 2004; Mackay,

Cousins, Kelly, Lee, & McCaig, 2004). From the perspective of managing psychosocial hazards, research in this domain can contribute to a more meaningful risk assessment process by unpacking the relative harm of stressors for the organization in terms of negative influence on work performance (Rick, Briner, Daniels, Perryman, & Guppy, 2001). Such research can also be used to determine the potential contribution of non-work factors, and has value in specifying the development of appropriate stress management strategies (Edwards & Rothbard, 2000). Examining the association between stressors and work performance may also link strategies for stress management and performance management. For some organizations the relative contribution of non-work factors may be slight, thus emphasizing the need for countermeasures for use within the working environment. For other organizations a strong contribution of non-work stressors to the prediction of work performance may indicate more generic countermeasures (e.g., Employee Assistance Programmes; Murphy, 2003). It would appear that understanding the reverse influence of work performance upon the appraisal of both work and non-work stressors would also provide organizations with complementary valuable information. For example, this process suggests that greater employee performance, which in itself can influence productivity, can also reduce the appraisal of both work and non-work stressors and could therefore be considered as a factor in the design of stress management or work-life balance programmes.

Spector et al. (1988) and more recently Lepine, Podsakoff, and Lepine (2005) state that more complex causal models and the use of multi-sample data within a longitudinal design are needed to examine the association between stressors and work performance. At present there appear to be no previous studies that incorporate such methodology to examine these relationships, which may be one reason why research in this field has produced inconsistent findings (Beehr, 1995). Thus, the present research should expand upon the limited current knowledge and therefore contribute to the literature regarding the causal relationship between work stressors, non-work stressors, and job performance by examining both one-way and reverse causation. This will hopefully provide evidence for the direction and type of relationship between these measures. A longitudinal, multi-sample design will be used and cross-lagged SEM techniques will be applied to the data.

Method

Design

A design was devised with data being collected from three groups of participants. The same self-completion questionnaires were distributed to all groups at two points in time. Distribution of questionnaires was via the organizations' internal mail and staff intranet systems. Participants were assured that responses would remain confidential and that they had the right to withdraw from the study at any time. Follow-up data was collected approximately 3 months after baseline for all three groups. Zapf et al. (1996) and Hart, Wearing, and Headey (1995) suggest that the current study's design is appropriate and fitting for this type of research, which tests the causal relationship between work and non-work stressors and work performance over time.

Participants

Sample One. The first group of participants consisted of staff employed at a university in South East England. According to their job titles, they were academic, management, and administrative. Approximately 1,000 employees were approached initially. A total of 269

members of staff completed the questionnaire at time phase one (T1; 27% response rate). The number of respondents at T2 was 123 (a response rate 46% of those at T1). Sixty-eight percent of the sample at T1 was female. Average age for this group was 43 years ($SD = 12.1$).

Sample Two. The second sample consisted of nurses who were on hospital ward placement. One thousand questionnaires were distributed and 454 nurses responded (45% response rate). At T2, 75 completed questionnaires were returned (a response rate of 17%). Seventy-eight percent of the sample was female, with a mean age of 28 years ($SD = 8.1$).

Sample Three. Sample three consisted of students who were also in part-time employment and studying at the same university as the staff employed in sample one. Two thousand questionnaires were distributed to participants at T1 and 781 participants completed them (39% response rate). A total of 169 completed questionnaires were returned at T2 (a response rate of 22%). Of the sample, 69% were female. Mean age was 25 years ($SD = 7.0$).

Questionnaires were distributed to groups via the institutions' global intranet systems, but it is possible that some participants did not have access to computers, had left the organization, or missed the request to participate in the survey at the follow up stage. Response rates were therefore lower than expected. However, longitudinal research measuring stressors and well-being that incorporates similar response rates is reported in the literature (e.g., Daniels & Guppy, 1994; Dewe, 1991; Dormann & Zapf, 2002). Non-response analysis was conducted to test if there was a difference between answers for participants who responded at both T1 and T2 and for participants who only responded at T1, which may have influenced results. Tests were carried out for all three samples of data. A series of t-tests examining differences between means for all measures (stressors, non-work stressors, and work performance) for T1 only participants and T1 and T2 participants found no significant differences in responses.

Data representing groups two and three were merged together since this strengthened the following analysis by increasing sample size, especially at T2. Sample sizes need to be substantial in order to estimate multi-domain longitudinal models such as that in the forthcoming analysis. Sample size at baseline for these two groups therefore became 1235. Samples two and three were chosen to be pooled, since they exhibited very similar demographic characteristics. For example, both samples represented trainees (students who had part-time jobs, and nurses), attended the same organization, were similar in age, and were mainly female. A test of equality of variance–covariance matrices suggested that the two covariance matrices were similar. Results produced a non-significant Box's M test value, $F(55,\ 30193) = 1.29$, $p > .05$, indicating that there were no differences in the matrices and similarity between the two groups was apparent.

Measures

Work-related stressors. Spector and Jex's (1998) Interpersonal Conflict at Work Scale (ICAWS) and Quantitative Workload Inventory (QWI), which incorporate four and five items, respectively, were used to measure workplace stressors. Responses were recorded on a 5-point Likert-type scale ranging from 1 = *less than once per month or never*, through to 5 = *several times per day*. A sample item from the scale is: "How often does your job leave you with little time to get things done?" High scores represent frequent conflict with others (ICAWS) and high level of workload (QWI). Spector and Jex (1998) found acceptable to

good levels of reliability for the two scales (Cronbach alphas of .74 and .82, respectively). Alpha values shown by the present data were .70 for the ICAWS and .91 for the QWI.

Non-work stressors. Two and three item scales measuring interpersonal conflict and quantitative workload, respectively, were used to measure non-work stressors. The same Likert-type scale used for the work-related stressors scales within the current study were also incorporated for these two non-work stressors measures. The two scales derive from Spector and Jex's (1998) workplace stressors measures that were used in the current study (ICAWS and QWI). To measure stressors in a non-work context, the items were modified appropriately to accommodate a non-work context. This procedure is similar in principle to work conducted by Warr (1990), where measures of competence and aspiration were used in both work and non-work contexts. Although many previous studies have examined the association between work–family conflict scales at one point in time using a single measure (for example, Bruck, Allen, & Spector, 2002) in order to perform longitudinal causal analysis the scales used in the current study were tested as independent variables.

A pilot study measuring both the ICAWS and the QWI scales was performed prior to distribution of the questionnaires to investigate the scales' internal reliability within a non-work life domain. For this pilot study, university undergraduate students completed the questionnaire which incorporated the two measures ($N = 83$). This was done since both measures have not yet been used in a non-working life context. An example of an item from the QWI measure is: "How often does your life outside of work leave you with little time to get things done?" Results produced good Cronbach's alpha reliability coefficients of .71 for the ICAWS and .77 for the QWI. The number of items from both scales was reduced to improve internal reliability. Further analysis using data from the current study produced alpha coefficients of .75 and .83 for the ICAWS and the QWI, respectively.

Work performance. Work performance was measured using a 3-item scale developed from the measure described by Guppy and Marsden (1997). Items are rated on a 5-point Likert-type scale (1 = *noticeably worse*, through to 5 = *noticeably better*) with higher scores representing improved job performance. An example of an item from the scale is: "How do you perceive your overall work performance?" Guppy and Marsden (1997) and Marsden (1992) reported internal consistencies for the scale of .61 and .89, respectively. Marsden (1992) found correlations between employee ratings and supervisor ratings on the measure of .67 and .84 at two time points for a sample of 104 employee–supervisor pairs, thus providing evidence that self-reports of performance are closely related to the ratings by employers. Scullen, Mount, and Goff (2000) also show that self-reports provide an accurate source of measurement in the assessment of work performance. While there is some support for the use of this particular measure, this view should be balanced by findings from a recent meta-analytic review by Taris (2006) which suggested an overall correlation close to zero between objective performance and subjective evaluations of work functioning, based on the personal accomplishment dimension of the Maslach Burnout Inventory. In the present study, participants were asked to rate their work performance over the past 3 months. Data from the study produced a Cronbach's alpha of .74.

Analytic procedure

Confirmatory Factor Analysis (CFA) tested the measurement models of all three measures. Based upon a similar analytic approach to that of De Jonge, Dormann, Janssen, Dollard, Landewwerd, and Nijhuis (2001), two competing longitudinal cross-lagged structural

equation path models were examined. A constrained stability model with no lagged causal effects was firstly estimated (Model A). Following this, Models B and Model C were nested individually within the stability model and compared against one another as competing models. These models represent:

Model A. A constrained model without cross-lagged effects but with temporal stabilities over time points. Model A has been estimated so that Models B and C can then consequently be tested as competing models.

Model B. A cross-lagged model with one-way structural paths from T1 work-related stressors and non-work stressors to T2 work performance (see arrows 1 and 2 in Figure 1).

Model C. A cross-lagged model with reverse structural paths from T1 work performance to T2 work-related stressors and non-work stressors (see arrows 3 and 4 in Figure 1).

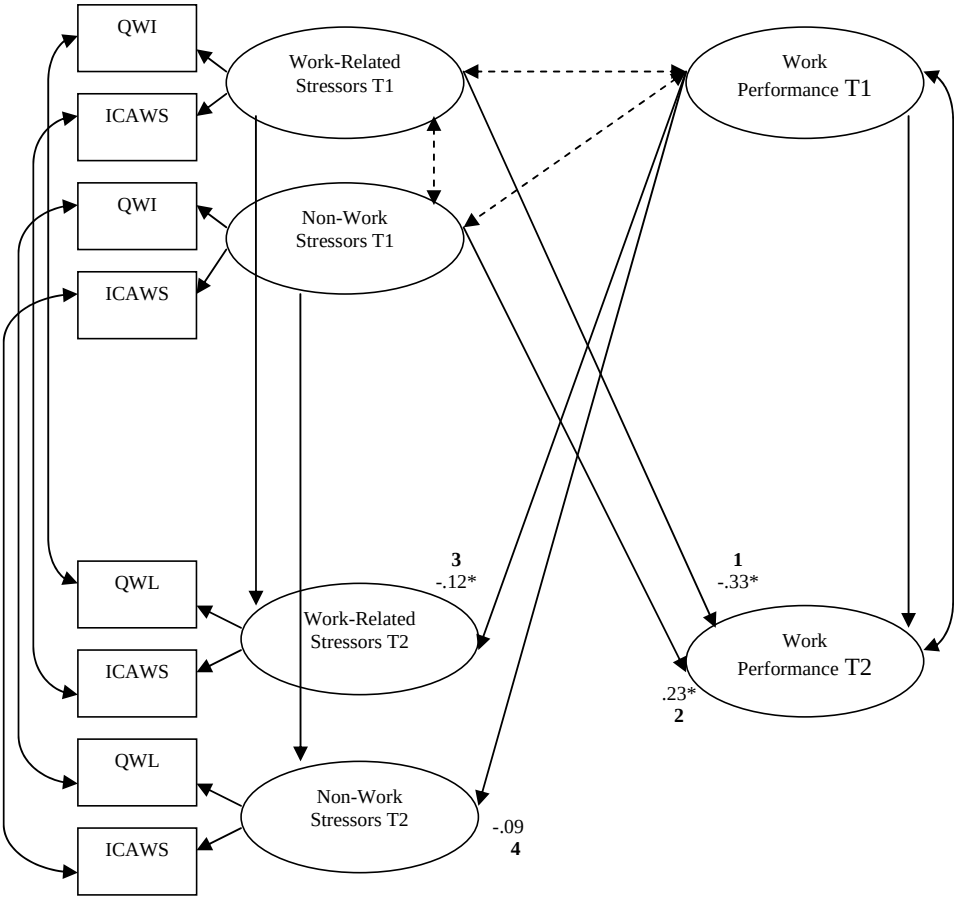

Figure 1. Longitudinal cross-lagged structural equation model.
ICAWS = Interpersonal Conflict at Work Scale; QWI = Quantitative Workload Inventory
Arrows 1–4 show structural paths. Double-headed arrows between T1 and T2 indicate correlations between measurement errors. Correlations represented by dashed lines indicate stabilities of all latent variables at T1.
*$p < .01$.

The analysis was based upon recommendations by Dormann and Zapf (2002) who argue that smaller, less complex models investigating associations between smaller numbers of variables are preferable to larger, more complex models that require larger sample sizes. Thus, the current analysis examines small competing models. The best fitting model from the above model comparison analysis was then examined via multi-group analysis in an attempt to cross-validate findings. The current study proposes the following hypotheses.

Hypothesis 1. Work and non-work stressors (T1) influence work performance (T2).

Hypothesis 2. Work performance (T1) influences the appraisal of work and non-work stressors (T2).

Preliminary analysis

The use of self-report measures has raised concerns regarding common method variance, where it is suggested that relationships between variables can become exaggerated (Kline, Sulsky, & Rever-Moriyama, 2000). A one-factor statistical approach was therefore performed in order to examine for the presence of method variance bias. This procedure is supported by Podsakoff and Organ (1986) and Podsakoff, Todor, Grover, and Huber (1984). Principal components factor analysis was conducted. All variables within the present study were entered. No indication of a general factor was present from the analysis. In addition to this, authors have suggested that using self-report measures is not necessarily a problem. For example, Glick, Jenkins, and Gupta (1986) found studies where similar correlations between self-report stressors and alternative observed stressors were both related to well-being factors (see also Kinnunen, Geurts, & Mauno 2004; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Semmer, Zapf, & Greif, 1996; Spector, 1987, 1994, 2006). However, in order to combat the influence of common method bias, the present research used measures with reverse response scales and reduced items, incorporated three groups of data, performed CFA, and measured scales over time (Schmitt, 1994). Table I provides the intercorrelations between all the measures used within the study across two time waves.

Table I. Intercorrelations between work stressors, non-work stressors & work performance at baseline (T1) and 3 months later (T2).

	1.	2.	3.	4.	5.	6.	7.	8.	9.
QWI (T1)									
ICAWS (T1)	.33*								
Non-work QWI (T1)	.36*	.25*							
Non-work ICAWS (T1)	.29*	.30*	.31*						
Work performance (T1)	−.27*	−.28*	−.20*	−.18*					
QWI (T2)	.45*	.29*	.25*	.28*	−.22*				
ICAWS (T2)	.23*	.35*	.22*	.33*	−.25*	.36*			
Non-work QWI (T2)	.30*	.24*	.30*	.25*	−.16*	.33*	.35*		
Non-work ICAWS (T2)	.19*	.27*	.28*	.36*	−.15*	.30*	.26*	.30*	
Work performance (T2)	−.23*	−.24*	−.16*	−.19*	.55*	−.29*	−.25*	−.24*	−.20*

ICAWS = Interpersonal Conflict at Work Scale; QWI = Quantitive Workload Inventory.
*$p < .01$.

Results

Confirmatory factor analysis

Confirmatory factor analysis was conducted first as standard procedure in SEM analysis in order to estimate the measurement models of all the scales incorporated within the forthcoming analysis. Maximum likelihood estimation to the covariances was used to test the three measurement models (Arbuckle & Wothke, 1999). The following statistics were used to assess the goodness-of-fit of all models to the data. The chi-square statistic, the goodness of fit index (GFI; Joreskog & Sorbom, 1988), the normed fit index (NFI; Mulaik, James, Van Alstine, Bennett, Lind, & Stilwell, 1989) and the comparative fit index (CFI; Bentler, 1990).

Second-order CFA models were analysed for the work and non-work stressors measures. This is because there are two latent constructs representing these two scales. In second-order CFA the first-order variables are explained by a single higher order structure (Byrne, 2001). For example, the work-related latent variable stressors measure to be incorporated within the following SEM section contains two subscales representing workload and interpersonal conflict, containing four and five observed items, respectively. These two subscales in second-order CFA are represented by one single second-order latent factor that reflects general work-related stressors. However, since the work performance measure within the current study consisted of only one factor, first-order CFA was performed. Using second-order latent variables reduces the potential number of causal pathways between particular variables, whereas use of first-order variables has the potential to become overly complex. It would therefore appear appropriate to perform second-order CFA models within the present study, considering that the following models are longitudinal and contain a number of variables estimated across work and non-work contexts. Hart et al. (1995) and Hart (1999) also incorporate second-order CFA measurement models within their research.

Work-related stressors. Chi-square produced a statistically significant value of 333.92 ($df = 26$), $p < .001$, for the ICAWS and the QWI (Spector & Jex, 1998). However, Bentler (1990) and Bollen and Long (1993) suggest that chi-square has limitations in that good-fitting models can be rejected on the basis of trivial misspecifications in regard to sample size. Nevertheless the goodness of fit statistics exhibited an acceptable fit to the data (GFI = .94, NFI = .91, and CFI = .91).

Non-work stressors. Confirmatory factor analysis was also conducted to test the non-work stressors measurement model (Spector & Jex, 1998). The chi-square statistic was statistically significant, with a value of 44.64 ($df = 4$), $p < .001$. The three other goodness of fit statistics provided an excellent fit to the data (GFI = .98, NFI = .98, and CFI = .98).

Work performance. First-order CFA was performed to examine the performance scale of the measurement model (Guppy & Marsden, 1997). The chi-square statistic produced a non-significant value of 0.47 ($df = 1$) $p < .001$, which reflects good fit. The three goodness of fit statistics also produced excellent fit to the data for the work performance scale (GFI = .99, NFI = .98, and CFI = .98).

Causal model analysis

All models were estimated by testing causal pathways between both first-order latent factors (work performance) and second-order latent factors (work-related and non-work stressors).

Table II. Longitudinal cross-lagged structural equation path models: Goodness-of-fit statistics & nested model comparisons.

Model	$\chi 2$	*df*	GFI	NFI	CFI
Model A	107.90	28	.90	.78	.82
Model B	41.93	26	.96	.92	.97
Model C	105.95	26	.91	.80	.83
Model Comparisons	$\Delta \chi 2$	*df*		*p*-value	
Model A & Model B	65.97	2		sig*	
Model A & Model C	1.95	2		n.s.	

*$p < .001$.

Hart et al. (1995), Hart (1999), and Frone et al. (1992) also use similar longitudinal SEM analytic approaches to the current research.

Sample size for all models was 244, based on pooling groups two and three. Error measurement for all observed variables was estimated for the three models (see Figure 1). The double-headed arrows between T1 and T2 on the left-hand side of the figure reflect correlations between measurement errors (which is conventional in SEM for longitudinal models). Correlations represented by double-headed arrows with dash lines estimate stabilities of all the latent variables at T1. Figure 1 and Table II represent all three models in the following analysis.

Model A. The four arrows (numbered 1-4 in Figure 1) reflecting the one-way and reverse cross-lagged relationship between stressors and job performance are constrained in this stability model. The chi-square statistic for Model A was significant at 107.90 ($df = 28$), $p < .001$. Goodness of fit statistics exhibited an overall poor fit to the data, confirming that Model A does not fit the data (GFI = .90, NFI = .78, and CFI = .82).

Model B. Model B estimates the one-way structural paths from work-related stressors and non-work stressors (T1) to outcome measure work performance (T2), reflected in arrows 1 and 2 in Figure 1. This model produced a significant chi-square value of 41.93 ($df = 26$), $p < .001$. Goodness of fit statistics show that Model B is a good fit to the data (GFI = .96, NFI = .92, and CFI = .97). The regression path from work stressors to work performance (arrow 1) produced the greater significant coefficient (-.33), indicating that a low level of workplace stressors predicted greater work performance. The regression path from non-work stressors to work performance (arrow 2) also produced a significant and strong causal path (.23). This relationship suggests that non-work stress is positively related to work performance.

Model C. Model C tests a reverse cross-lagged model with structural paths from work performance (T1) to work-related and non-work stressors outcome measures (T2). The relationships of interest in Model C are represented by arrows 3 and 4 in Figure 1. The chi-square statistic was significant at 105.95 ($df = 26$), $p < .001$, with goodness of fit statistics indicating that Model C did not fit the data (GFI = .91, NFI = .80, and CFI = .83). Only the regression path from work performance to work-related stressors (arrow 3) produced a significant value, indicating that work and non-work stressors taken together were not predicted by work performance.

Table II shows the results of the model comparison analysis. The chi-square difference test determines whether nested models would benefit from additional constraints (Bentler & Bonett, 1980). This analytic approach tests the difference between competitive models by comparing individual model chi-square values and associated number of degrees of freedom with the corresponding difference in chi-square and number of degrees of freedom of the competing model.

First, the comparison between Model A (a constrained model without cross-lagged effects) and Model B (a cross-lagged model with one-way structural paths from T1 work-related stressors and non-work stressors to T2 work performance) shows that the chi-square difference test between the two models is significant (Model A vs. Model B: $\chi 2$ ($df = 2$) = 65.97, $p < .001$). This suggests that Model B better accounts for the data than Model A, indicated by Model B's better chi-square value and goodness of fit statistics. Statistically it would therefore appear evident within the current data that both work and non-work related stressors influence job performance.

Second, the comparison between Model A (a constrained model without cross-lagged effects) and Model C (a cross-lagged model with reverse structural paths from T1 work performance to T2 work-related stressors and non-work stressors) was examined. The chi-square difference test between these two models is non-significant (Model A vs. Model C: $\chi 2$ (2) = 1.95, *ns*). This indicates that Model C has no better statistical fit than Model A. This provides statistical evidence that job performance did not influence work and non-work related stressors within the current data.

No possible nested model comparison analysis could be statistically conducted between Model B and Model C due to the design of the models. This was also apparent within De Jonge and colleagues' (2001) study. Alternatively, the Akaike information criterion (AIC; Akaike, 1987) fit index was used that compares non-nested models. Better fitting models are represented by a smaller AIC value. Model B exhibited a smaller AIC with a value of 99.93 as opposed to Model C with a value of 165.16. Model B's much lower chi-square indicates that it fits better than Model C.

Therefore, based upon the results from the model comparison analysis as well as considering the overall best fit from the individual SEM analysis conducted earlier, the best fitting model is Model B. In terms of chi-square relative to the degrees of freedom, Model B also exhibits the best fit. Values of less than three indicate an acceptable fit as indicated in the ratio obtained by dividing the chi-square value by the related degrees of freedom (see Carmines & McIver, 1981). Model B also produced the best goodness of fit statistics of all the three models overall. In order to examine whether the parameter estimates varied across occupational groups, a follow-up multi-group analysis was conducted using the sample one data. This analysis revealed no major differences between the groups, suggesting that the final model was basically the same across groups (detailed results can be obtained from the authors).

Discussion

The aim of this study was to conduct original research into the causal associations between work and non-work stressors and job performance. A rigorous methodology was used to examine the findings, based primarily upon the recommendations by Zapf et al. (1996) involving a longitudinal multi-sample design incorporating cross-lagged SEM statistical analysis approaches. Confirmatory factor analysis produced an acceptable to strong fit

across the three measurement models used within the present study, revealing that the scales used in this research are psychometrically sound. Model comparison analysis revealed that good fitting Model B, a model with one-way causal pathways from T1 work-related stressors and non-work stressors to T2 work performance, was the best fitting model. This finding is consistent with the present paper's original hypothesis as to the causal direction between the investigated factors. Competing Model C, however, a model with reverse structural paths from T1 work performance to T2 work-related stressors and non-work stressors, did not fit well. The causal paths within the best fitting Model B were also found to be invariant across both groups of data. Thus, whereas hypothesis 1 was upheld within the current study (Model B), hypothesis 2 was not (Model C).

Research performed in the current study can be used to support particular models of stress and performance put forward by Sullivan and Bhagat (1992). For example, best fitting Model B reveals both a negative and positive linear relationship with work performance in relation to both work-related and non-work related stressors, respectively. However, the present results do not support alternative models that hypothesize there is no relationship between these variables. The current study also provides evidence to support previous research conducted by, for example, Iaffalano and Muchinsky (1985), Jex, (1998), Motowidlo et al. (1986), Siu (2003), and Steen et al. (1998) who propose that there is a negative relationship between workplace stressors and job performance. However, findings from Model B within the present study are inconsistent with results derived from Van Dyne et al. (2002) in regard to the nature of the causal patterns between work and non-work factors. For example, Model B shows a significant negative causal relationship with work stressors and performance and a significant positive association with non-work stressors and performance, whereas for Van Dyne et al. (2002) these causal patterns were in the reverse direction. There are possible interpretations of this somewhat unexpected positive association between work stressors and job performance. Farr and Ford (1990) and Ford (1996) suggest that stressors at home could cause individuals to direct their focus on performance at work. Alternatively, and in relation to hypothesis 2 (Sullivan & Bhagat, 1992), low levels of stressors may fail to challenge particular individuals and therefore fail to influence performance. It can be observed that the within-domain relationship between work stressors and work performance is stronger than the relationship between non-work stressors and work performance (see Figure 1). Nevertheless, these findings still further uncover the strong influence that non-work factors have upon workplace behaviours.

It would therefore seem that the initial proposition concerning the present study was largely supported. For instance, both work and non-work stressors were found to significantly influence job performance. The alternative proposition that job performance also affects the perception of both work and non-work stressors was not supported. However, the effect of work performance alone on the appraisal of work stressors was significant, indicating that perhaps performance can influence self-confidence which could lead to a re-appraisal of stressors.

Study limitations

It is important to put the current findings in context by acknowledging limitations in the study, and thus to suggest ways forward for future research of this nature. Crucial to this field is the nature and measurement of performance, and there is no doubt that triangulation of self-ratings with supervisor ratings and more objective indicators would be an important way forward (Taris, 2006; Viswesvaran, Schmidt, & Ones, 2005). Similarly, it is clear that longitudinal designs have important benefits in raising the quality

of conclusions that can be made from research in this field (Zapf et al., 1996). However, embracing longitudinal designs means confronting the competing issues of time lag and response rates. Shorter intervals between measurement points should mean higher follow-up response rates, although intervals need to be long enough to allow for variations in outcome measures to be more than noise. In their review of longitudinal research on work stress, Zapf et al. (1996) noted that the shortest time lag was a little as a month, with the majority of studies having intervals of 6 months to 1 year. While the 3 month interval in the current study may have limited the observed associations between stress and performance, the low follow-up response rates would have probably been lower still had the gap been substantially increased. However, it is clear from intervention studies, such as Guppy and Marsden (1997), that substantial changes in performance across self ratings, supervisors ratings, and objective indicators are measurable over 6 month intervals.

As a further limitation, it should be noted that the pooled sample of data used in the current study were mostly young women. Therefore, generalizability of the results should be met with caution.

Future research

The following issues should be considered when conducting future research in this field of study. First, studies in this field would probably benefit from the addition of qualitative data to accompany the quantitative methods associated with this style of research. Second, although the current study incorporates multi-sample data, it is recommended that future research uses samples of data from other occupational groups in an attempt to further cross-validate results. It should be noted that inconsistency between the current research results and other empirical findings on the relationship between stressors and performance may be partly due to specific operationalizations of "stressors" in different studies. For instance, similar studies may measure conceptual aspects of work stressors other than workload and interpersonal conflict. This issue has also been raised by Beehr (1995).

The strong influence of factors outside of work should also be addressed when performing future research in this field. Based upon the results from the current study and other similar research (Edwards & Rothbard, 1999; Hart, 1999; Van Dyne et al., 2002), it is believed that occupational stress models that fail to acknowledge the importance of non-work contexts also fail to address fully the range of characteristics that are associated within the field at both an individual and organizational level. This challenge is particularly important when longitudinal designs can be adopted to more firmly identify the nature and extent of causal relationships. It is through this more fundamental work that strong messages can be developed. A clear indication of the impact of work and non-work stressors on bottom line outcome measures such as work performance, absenteeism, and turnover adds value to the research literature, since such information will motivate managers and employees to work together to implement successful solutions.

Summary comments

The current study builds upon previous research that examines the causal relationships between work and non-work stressors and work performance by incorporating a longitudinal design, multi-group samples of data and one-way and reverse cross-lagged SEM statistical techniques in order to strengthen the findings. Thus, this research attempts to be thorough in its methodological design, statistical procedures and theoretical ideas. The present research is unique in that the associated recommended statistical approaches have

never before been used simultaneously within a single study to test the causal relationships between stressors and job performance. The findings from the SEM showed that both work-related and non-work stressors affected job performance. Nested model comparison analysis supported this, and emphasized a strong influence of non-work factors on performance at work.

Note that the present study does not dismiss alternative, competing theories in favour of the negative linear theory supported by this research. For example, whereas the negative linear theory and the inverted-U theory employ different definitions and metrics of stress (Muse, Harris & Field, 2003), to some extent they lead to similar predictions regarding the relationship between demands, stress and performance. The inverted-U theory assumes that demands induce arousal, and its optimum value occurs when such demands are absent. High demands will therefore lead to stress. On the other hand, the negative linear theory considers stress as a response to a misfit between demands and the individuals' capabilities, and its optimum value is obtained when this fit is optimal. This implies that here, too, high demands will usually (but not always) lead to stress, as few individuals will possess the capabilities to deal with these demands.

In the UK, the Health and Safety Executive (2000) identified work stress as one of its eight "Priority Programme" areas for the decade. A significant amount of research and development activity has been accomplished since then, with clear benefits for researchers as well as managers (Cousins et al., 2004; Mackay et al., 2004). Almost the entire output from this programme has been made available on the Internet, where the research and development materials are accessible worldwide (see www.hse.gov.uk/stress). Adopting a rigorous risk management approach seems to have had very clear benefits in developing advice and support for managers and employees in terms of risk assessment methods as well as important practical solutions to compliance and the development of best management practice (e.g., Jordan, Gurr, Tinline, Giga, Farager, & Cooper, 2003; Thomson, Neathey, & Rick, 2003).

It has been suggested that the relationship between job satisfaction and work performance could be described as the "Holy Grail" of industrial psychology (Landy, 1989). However, it is clear that research identifying causal relationships between work performance and many other factors are of utmost importance in the practical world of applied psychology. The relationship between work and non-work stressors and performance is clearly a significant one that requires further research.

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