The Role of Negative Affectivity in the Stress Process: Tests of Alternative Models

Penny Moyle


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The role of negative affectivity in the stress process: tests of alternative models

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Summary

The prominence of the personality trait of Negative Affectivity (NA) in the stress literature has increased over the last decade. Negative affectivity has been widely reported both to have direct effects on measures of strain, and to act as a potential confounding variable of stressor–strain relations in self-report research (Watson and Clark, 1984). However, more recent work has demonstrated that NA can also moderate environment–outcome relationships, acting as a vulnerability factor in the stress model, or alternatively that its influence may be mediated through perceptions of the work environment. In the present study, these four possible pathways through which NA may be implicated in job satisfaction and symptom report were examined.

In terms of symptom report, NA was found to have direct effects, to act as a partial confound, and to play a significant moderating (vulnerability) role. In contrast, for the prediction of job satisfaction, the influence of NA was found to be mediated through perceptions of the work environment. It is concluded that all these potential roles of NA should be more thoroughly considered in future stress research.

Introduction

Negative affectivity (NA) is defined as a mood-dispositional dimension reflecting pervasive individual differences in the experience of negative emotion and self-concept (Watson and Clark, 1984); trait anxiety (Spielberger, Gorsuch and Lushene, 1970) and neuroticism (Eysenck and Eysenck, 1975) are commonly used measures of NA. Most recent research, particularly in the U.S.A., has focused on the role of NA as a potential confounding variable in stressor–strain relations. This focus has overshadowed the other possible roles of NA in the stress process. A conceptual framework of the stress process has been put forward by James House and his colleagues (e.g. House, 1981; Israel, Schurman, Hugentobler and House, 1992). Examining NA as an individual characteristic within this paradigm throws further light on the mechanisms through which NA might be implicated in stressor–strain relations. In this model of the stress process, objective conditions are mediated through individual stress perceptions to influence short-term responses and long-term strain outcomes: individual or situational characteristics may condition

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NA has a direct effect on the strain measure. This occurs independently of any relationship between either variable and perceptions of the work environment.

(b) NA as a confound, giving rise to spurious correlations between environment and strain measures. The association between work environment perceptions and strain is reduced when the influence of NA is controlled (shown as a dashed arrow).

(c) NA as a moderator: an individual’s level of NA of will determine their response to features of the environment.

(d) The influence of NA is mediated through perceptions of the work environment. The association between NA and strain is reduced when the influence of work environment perceptions is controlled (shown as a dashed arrow).

Figure 1. Four possible pathways through which negative affectivity might influence strain outcomes.

or ‘modify’, directly or indirectly, each step in this process. Casting NA as a ‘modifying’ variable in this model, reveals four pathways through which this individual difference may influence strain outcomes.

The focus of the present study is in examining relationships between perceptions of the psychosocial work environment and indices of (short-term) strain, and how NA might be implicated in these relationships. Although it is possible for several of the pathways specified by this paradigm to operate simultaneously, to clarify the four potential pathways through which NA might act to influence strain, each is presented individually in Figures 1a to 1d. The direction of causality implied by the arrows in these figures is based on the assumption that NA is a stable trait that precedes experience of the work environment and strain outcomes. Similarly, exposure to the work environment is assumed to precede the onset of strain.

The introduction will first consider the evidence in support of these four NA roles and will then outline the conditions under which work perceptions and strain outcomes might be susceptible to the influence of NA.

**Direct effects of NA**

A consistent finding is that people who are high in NA also score highly on self-report symptom scales such as the General Health Questionnaire (e.g. Goldberg, 1972; Watson and Clark, 1984). This finding has led to some debate as to whether high NA individuals experience poorer health, or
merely report greater distress. The strongest evidence of a direct link between NA and physical health has been put forward by Eysenck (1991) who reported higher death rates (from cardiovascular disease and cancer) in people with high neuroticism scores, in a 13-year prospective study. The contrasting view suggests that, although NA is related to complaints about health, its links with actual disease are unproven (e.g. Costa and McCrae, 1987; McCrae, 1990; Watson and Pennebaker, 1989). Either way, there is an undeniable relationship between NA and commonly used health measures.

**NA as a confounding variable**

The most frequent reference to NA in the stress literature is in a debate about whether this trait might act as a confounding (nuisance) variable, spuriously inflating correlations between self-report measures of stressors and strains. There are two aspects to this issue. First, there are psychometric difficulties of content overlap between conceptually different scales. Second, there are problems of general response bias operating over all self-report indices.

Schroeder and Costa (1984) suggested that content overlap between scales designed to measure stressful life events, neuroticism, and health outcomes was the cause of correlations between life stressors and illness reported in the literature. They found that when items of potential content overlap were removed from these scales, correlations between stressors and strains were not significant. However, other researchers have argued that stressor, strain and neuroticism scale items are conceptually distinct, and that research in which this methodological issue have been suitably addressed continues to reveal substantial correlations between stressor and strain scales (Maddi, Bartone and Pucetti, 1987; Schaubroek, Ganster and Fox, 1992).

An alternative explanation for the observed correlations between self-reported stressors and strains, is that NA underlies a general response tendency, which acts to inflate the correlation between self-report scales (e.g. Costa and McCrae, 1987; McCrae, 1990). In several investigations it has been demonstrated that the correlations between self-reports of stressors and strains are reduced when the common variance attributable to NA is partialled (e.g. Brief, Burke, George, Robinson and Webster, 1988; Payne, 1988; Burke, Brief and George, 1993). These findings have called into question a large proportion of psychological stress research, which rests upon demonstrated correlations between self-reports of stressors and self-reports of strain. Watson, Pennebaker and Folger (1987), represent the extreme view in this confounding variable debate. They concluded, 'To the extent various self-report measures all tap the same underlying NA construct, presumed “independent variables” and “dependent variables” in many stress studies may represent little more than different measures of the same thing — and that thing is not necessarily the construct of stress, but perhaps merely the predisposition to respond negatively' (p. 155).

However, other stress researchers, cautioning against throwing the proverbial baby away with the bath water, have reported convergent validity of self-report measures with independent assessments of stressors and strains, including physiological outcomes (e.g. Frese, 1985; Spector, Dwyer and Jex, 1988). Furthermore, although controlling statistically for NA has been shown to weaken the correlations between stressors and strains, such correlations often remain statistically significant. Chen and Spector (1991) explicitly made this point, but examples are numerous, including papers where the emphasis is on the nuisance properties of NA (e.g. nine of the 15 stressor–strain relations reported by Brief et al. (1988) remained statistically significant after controlling for NA).

Finally, analysis of discrepant findings suggests that some types of stressors and some types of outcomes are particularly susceptible to NA contamination. Specifically, measurements of life stress generally require subjects to make subjective judgements about stressor impact, whereas in
work stress research, job stressor instruments are more objective, asking subjects to note the presence or absence of some feature (Schaubroek and Ganster, 1991; Schaubroek et al., 1992, Chen and Spector, 1991). Similarly, the reduction in variance attributable to the environment that occurs when controlling for NA is much larger in the prediction of symptom report than for job satisfaction (Burke et al., 1993; Chen and Spector, 1991; Schaubroek and Ganster, 1991; Schaubroek et al., 1992; Terry, Nielseni and Perchard, 1993). Two explanations for this difference have been put forward: either different types of outcomes (affective versus health outcomes) are differentially influenced by NA or, alternatively, the observed differences may be a methodological artefact due to the positive framing of satisfaction questionnaires, compared with the negative framing of symptom report scales.

NA as a moderator of stressor–strain relations

Taking a different view of NA, Spielberger et al. (1970), characterized trait anxiety (a measure of NA) as a tendency to react adversely to social and psychological stressors, that is, as a vulnerability factor. Parkes (1990) tested this hypothesis in a sample of trainee teachers and found that NA not only acted to inflate correlations between work perceptions and outcomes (mental well-being) but, more specifically, NA moderated the relationship between work demands and well-being. High NA individuals perceived their work environment as being generally more stressful, and also showed a more reactive response to the same level of perceived demands, when compared with their low NA counterparts. NA did not however act to moderate the impact of work support. Comparable NA-moderation has been reported Denney and Frisch (1981) and Bolger and Schilling (1991) for responses to life stressors. Similarly, Schaubroek and Ganster (1991) cited an unpublished finding in which neurotic (high NA) introverts were more reactive to stressors in terms of symptom report, in a three-way interaction effect.

The evidence with regard to affective outcomes is less clear. In a laboratory setting, Larsen and Katelaar (1991) reported stronger induction of negative mood in subjects with high neuroticism scores; similarly Parasuraman and Cleek (1984) reported that affective reactions to work overload were moderated by NA. In contrast, Levin and Stokes (1989) tested the moderation hypothesis with respect to the prediction of satisfaction, in a laboratory setting, but found that there was no interaction effect: both high and low NA subjects responded favourably to task enrichment.

Indirect effects of NA

A fourth possible role of NA is an indirect, mediated pathway whereby, although not directly related to a specific outcome, NA may act to influence perceptions of the work environment, which in turn are associated with strain. This role, although alluded to in general discussions of negative affectivity (e.g. Costa and McCrae, 1980, 1987; Watson and Clark, 1984), has not received direct attention in many empirical investigations. Staw, Bell and Clausen (1986, p. 61) described the role of personality in this process as follows, 'People may bring a positive or negative disposition to the work setting, process information about the job in a way that is consistent with this disposition, and then experience job satisfaction or dissatisfaction as a result'. Levin and Stokes (1989) explored these indirect effects empirically and found evidence for mediation of the relationship between NA and job satisfaction, through work perceptions. However, the affective measure used by Levin and Stokes to some extent confounds positive and negative affectivity, as posited by Watson and Tellegen (1985). More recently, Terry et al. (1993) replicated this finding in the prediction of job satisfaction, using neuroticism as the measure of NA. Furthermore, like Levin
and Stokes, Terry et al. demonstrated that the influence of NA in the prediction of mental health was direct rather than mediated.

**Potential work stressors**

The work stress literature identifies several features of the work environment that act as potential sources of stress. The amount and type of workload, the degree of autonomy or discretion at work, and the supportiveness of colleagues have been identified as central features of the work environment (Johnson and Hall, 1988; Payne and Fletcher, 1983; Parkes, Mendham and von Rabenu, 1994). In addition to these well-established work characteristics, measures of organizational culture may also be important in influencing strain outcomes (Schriber and Gutek, 1987; Landy, Rastegary, Thayer and Colvin, 1991).

**Workload**

Quantitative workload or demand is usually positively associated with strain. This has been a common finding among stress researchers, particularly in the prediction of anxiety (e.g. Broadbent, 1985) but also in relation to more general psychological distress (Bromet, Dew, Parkinson and Schulberg, 1988; Karasek, 1979; Karasek and Theorell, 1990; Perrewé and Ganster, 1989).

**Fluctuations in demand**

The degree to which work demands are continuous as opposed to fluctuating, has received little attention in the past, but may also be a potential work stressor. The difficulties created by a fluctuating workload may be related to the unpredictability of fluctuations, as uncertainty of work demands has been identified as a potential source of strain (Sutton and Kahn, 1987; Tetrick and LaRocco, 1987).

**Control or discretion**

The level of discretion or control available to an individual in his or her work situation has been widely investigated and generally found to be negatively associated with strain; low control predicting high strain (see Parkes (1989) for a review, or Spector (1986) for a meta-analysis).

**Social support**

The balance of evidence regarding social support indicates that lack of support can have direct, additive effects on strain outcomes (Landsbergis, Schnall, Deitz, Friedman and Pickering, 1992; Loscoscocco and Spitze, 1990; Melamed, Kushnir and Meir, 1991; Schaubroek et al., 1992), although it may also buffer stressor–strain relations (Cohen, 1988; House, 1981; Wells, 1982). It is the direct effects of social support that will be considered in the present study. Wells (1982) found that support from superiors is particularly important with respect to work stress; accordingly this is examined here.

**Time orientation**

Schriber and Gutek (1987) suggested that time is a basic dimension of organizations, which can affect employee performance and satisfaction. Two aspects of time orientation are considered here: the importance of quality versus speed of work, and the degree to which a company plans for the future. The requirement to produce high quality work, particularly when individuals are operating under tight time constraints, necessitates decisions about quality versus quantity trade-offs, and is a potential source of conflict. Similarly, the time horizon of a company may greatly impact upon work organization and attitudes (Jaques, 1989).
Measures of strain

Strain is not a unidimensional construct. Conventional strain outcomes such as satisfaction, anxiety, frustration, depression, arousal and symptomatology have been found to be differently influenced by variations in work demand, control and support (Broadbent, 1985; Evans, Shapiro and Lewis, 1993; Hesketh and Shouksmith, 1986; Spector, 1987; Steptoe, 1989; Warr, 1990). For example, job satisfaction has been found to be more closely associated with level of control than with physical or behavioural measures of strain (Jackson, 1989; Ganster, 1989; Sauter, 1989). Furthermore, as outlined above, the influence of NA on stressor–strain relations may also vary according to the outcome of interest (Schaubroeck and Ganster, 1991). Accordingly, in the present study, models for two distinct outcomes will be examined for job satisfaction, and for physical and psychological symptom report (well-being).

Research hypotheses

On the basis of the research findings presented, it is argued that negative affectivity can act to influence strain measures through each of the four pathways represented in Figure 1, and thus all potential pathways should be examined. Furthermore, the relative importance of each process depends upon the outcome measure of interest. Thus, the influence of NA on job satisfaction is predicted to be different from that on the symptom report measure (Burke et al., 1993; Schaubroeck et al., 1992).

In particular, different studies have previously shown NA to play direct, confound and moderator roles in the prediction of symptom report. For job satisfaction, the direct and confound roles of NA are expected to be less important, whereas the mediated influence of this disposition through perceptions of the work environment warrants empirical investigation. The potential moderating role of NA in the prediction of job satisfaction is less clear, as the limited available research evidence is somewhat contradictory regarding this role. Specific hypotheses are listed below, together with reference to the models presented in Figure 1 where appropriate.

H1. NA will be correlated with self-report ratings of both the work environment and outcomes. (A direct effect: Figure 1a).

H2. The five work environment measures will jointly predict both job satisfaction and well-being.

H3. Controlling for NA will reduce stressor–strain associations, but this effect will be less marked for the prediction of satisfaction than for well-being (as reported, by Brief et al., 1988). After control for NA, statistically significant stressor–strain associations will remain. (NA as a partial confounding variable: Figure 1b).

H4. NA will moderate the relationship between work environment measures and well-being, such that high NA acts as a vulnerability factor (as reported by Parkes, 1990). On an exploratory basis, the potential moderating role of NA in the relationship between the work environment and job satisfaction will also be tested. (NA as moderator: Figure 1c).

H5. In the prediction of job satisfaction, the effect of NA is expected to be mediated through work environment perceptions (as reported by Levin and Stokes (1989) and Terry et al. (1993)). The evidence for strong direct effects of NA in the prediction of symptom report suggests that significant mediated effects are unlikely. (NA mediated through work perceptions: Figure 1d).
Method

Subjects

The 143 participants in this study were drawn from three general work groups: 21 from small businesses, 36 from a branch of a national bank, and 86 from a business consultancy company. Response rates in the three groups were 70 per cent, 45 per cent and 57 per cent, respectively, which are similar to those reported by other researchers working in applied settings (e.g. McLaney and Hurrell, 1988; Spector, 1987). Although all participants were involved in office work, a wide range of occupations and work environments were covered to ensure suitable variance on the work measures of interest.

Respondents' ages ranged from 17 years to 59 years, (mean 32.8 ± 8.2 years), 39 per cent of the sample were female, and 74 per cent lived with a partner. In terms of level of education, the sample reported much greater education than the general population: the predominance of university education (27.3 per cent with a university degree, a further 29.4 per cent with a higher degree) is particularly noteworthy, and was spread between the small business and consultancy groups.

Measures

Work demands measures

Perceived workload, and fluctuations in workload were measured using self-report scales adapted from Sauter (1989). The Sauter demands scale consisted of 20 items taken from the Work Environment Scales (Insel and Moos, 1974) and the Michigan Institute for Social Research scales (Caplan, Cobb, French, Harrison and Pinneau, 1975). In a study of health complaints in office workers, Sauter (1989) used this scale to show that (high) demand and (low) control were associated with high reported illness and job dissatisfaction. All items were presented in a 5-point Likert response format. The workload scale (14 items) was found to have a high internal consistency, $a = 0.83^1$. Consistency in the shorter fluctuations in workload scale (six items) was lower at $a = 0.61$: although relatively low, internal consistencies in this range are frequently cited for shorter scales in the applied research literature (e.g. Rafaeli, 1986; Sage and Koslowsky, 1994; Spence, Helmrich and Pred, 1987).

Control

Level of decision latitude or control was also measured using items from Sauter's (1989) scales. The 14-item control scale demonstrated good internal consistency, $a = 0.78$. All the Sauter items were presented in the questionnaire as a single mixed work environment scale.

Social support

The support from senior colleagues scale was taken from House's (1981) social support measure. The senior support subscale is composed of six items, concerning the extent to which senior colleagues are helpful, reliable and competent with respect to difficulties encountered at work. All questions were answered on a 4-point response format ranging from 0 (not at all supportive) to 3 (very supportive). The scale had an internal consistency of $a = 0.89$.

Time orientation

This 4-item scale was adapted from Schriber and Gutek's (1987) Time-At-Work questionnaire. Sample items are 'Doing things right is better than doing things fast', and 'Planning for the future is

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$^1$ All reported alphas are standardized.
important here’. Again, items were presented in a 5-point Likert response format; a high score indicates time orientation emphasizing quality (over speed) and a strong future orientation of the company. The items were presented together with other Time-At-Work subscales, which are not included in the current analysis due to their similarity to the Sauter work demands and control scales. Although capturing two aspects of time culture, as reported by Schriber and Gutek, these four items were found to load onto a single factor in a principal components analysis. Internal consistency of the scale was $\alpha = 0.70$.

**Well-being**
Well-being was assessed using a 12-item scale from the General Health Questionnaire (GHQ-12, Goldberg, 1978). This scale asks respondents to indicate the extent to which they have experienced a list of somatic and affective symptoms over the past six weeks, relative to their ‘usual’ level of health. The scale has been shown to have good reliability and validity for working populations (Banks, Clegg, Jackson, Kemp, Stafford and Wall, 1980), and has been validated against clinical ratings of mental health (Banks, 1983). In the present sample, internal consistency was $\alpha = 0.90$.

**Job satisfaction**
The 10-item job satisfaction scale was adapted from Caplan *et al.* (1975), and asked respondents to rate various features of their job on a 4-point scale from ‘very dissatisfied’ (1) to ‘very satisfied’ (4). These features included physical working conditions, working hours and shift arrangements, future work prospects, consultation about changes, co-workers, and the way skills and abilities are utilized. The scale was found to have a high internal consistency of $\alpha = 0.82$.

**Negative affectivity**
Eysenck and Eysenck’s (1975) neuroticism scale was devised for gauging the extent to which an individual tends to be worried, anxious, or pessimistic, and is widely used as a measure of negative affectivity (Watson and Clark, 1984). In this study the short, 12-item scale was used (Eysenck, Eysenck and Barrett, 1985). Internal consistency for this sample was $\alpha = 0.84$.

**Statistical treatment**
The role of NA was examined separately for job satisfaction and symptom report through multiple regression analysis procedures. A significant additive term for NA indicates a direct effect as illustrated in Figure 1a.

Baron and Kenny’s (1986) prescription for testing a mediation effect using regression methods, is statistically the same as that used to test NA as a confounding variable (Brief *et al.*, 1988). Firstly, NA must be correlated with both the proposed stressor (environmental measure) and the outcome measure. Secondly, the environment measure must significantly predict the outcome measure. Finally, the outcome is simultaneously regressed onto the stressor variable and NA. The result of this simultaneous regression reveals whether NA or the proposed stressor is the mediator. If, in the simultaneous equation, NA is found to predict the outcome while the stressor variable is reduced to an insignificant level, this demonstrates a confounding effect (Figure 1b). If, however, it is the NA term that is significantly reduced, then the environmental measure (proposed stressor) would be seen to be the mediator (Figure 1d). The four potential environmental stressor variables were examined for potential mediation in a single simultaneous step (rather than in separate analyses) to reduce the probability of Type I error.

To test for NA as a moderator, it is necessary to enter the cross-product terms of NA and each hypothesized stressor in a separate block in an hierarchical regression analysis, following the entry
of both the stressor variables and NA as first-order terms (Cohen and Cohen, 1983; Baron and Kenny, 1986). Extending Parkes' (1990) analysis, which investigated the moderation of social support and demand by NA, all five stressor–NA product terms were entered simultaneously and their significance tested in the final hierarchical step. As recommended by Finney, Mitchell, Cronkite and Moos (1984), all continuous measures were standardized before analysis to assist in interpretation of interaction effects (at the average level of all other variables).

Results

Means, standard deviations and intercorrelations

Table 1 presents the means, standard deviations and Pearson intercorrelations for each of the questionnaire variables. From this table, GHQ score (symptom report) is seen to be significantly correlated with each of the work environment measures, in addition, job satisfaction was correlated with control, senior colleague support, and time orientation. Furthermore, NA was significantly correlated with both outcomes of interest, and also with two of the five work environment measures.

Hierarchical regression analyses: prediction of GHQ score and job satisfaction

The four potential roles of NA in the stress process were tested using multiple regression analyses, separately for each of the outcomes. The results of these analyses are presented in Tables 2 and 3. Model 1, ('NA model'), shows the prediction of each outcome from NA alone, and is a test of hypothesis 1. Similarly, model 2, ('Environment model'), predicts each outcome from the five environment variables entered simultaneously and is a test of hypothesis 2. Models 1 and 2 may be seen as alternative first steps of an hierarchical regression, with model 3, ('Additive model') in which the environment variables and NA are combined additively, as the second step. Comparison of model 3 to models 1 and 2 indicates the contribution made by NA and the environmental

Table 1. Means, standard deviations, and Pearson intercorrelations of variables

<table>
<thead>
<tr>
<th>Measures</th>
<th>Mean</th>
<th>S.D.</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GHQ-score</td>
<td>11.33</td>
<td>5.74</td>
<td>-0.48***</td>
<td>0.55***</td>
<td>0.18*</td>
<td>0.25**</td>
<td>-0.26**</td>
<td>-0.34***</td>
<td>0.24**</td>
</tr>
<tr>
<td>2. Satisfaction</td>
<td>26.95</td>
<td>5.17</td>
<td>-0.20*</td>
<td>0.11</td>
<td>0.00</td>
<td>0.39***</td>
<td>0.59***</td>
<td>0.51***</td>
<td></td>
</tr>
<tr>
<td>3. Neuroticism</td>
<td>4.69</td>
<td>3.47</td>
<td>0.04</td>
<td>0.13</td>
<td>-0.27**</td>
<td>-0.20*</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Demands</td>
<td>53.69</td>
<td>7.23</td>
<td>0.11</td>
<td>0.20*</td>
<td>-0.21*</td>
<td>-0.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Fluctuations in workload</td>
<td>16.50</td>
<td>3.36</td>
<td>0.03</td>
<td>-0.03</td>
<td>-0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Control</td>
<td>44.09</td>
<td>8.41</td>
<td>0.16</td>
<td>0.23**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7. Social support from senior colleagues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.56***</td>
</tr>
<tr>
<td>8. Time orientation</td>
<td>14.19</td>
<td>3.54</td>
<td></td>
<td></td>
<td></td>
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*p < 0.05; **p < 0.01; ***p < 0.001.
Correlations have been calculated only for subjects with complete data, N = 129.
Table 2. Hierarchical regression analysis predicting \textit{GHQ score (symptom report)} from NA, work demands, fluctuations in workload, social support from senior colleagues and time orientation

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Neuroticism (NA)</td>
<td>0.551***</td>
<td>—</td>
<td>0.464***</td>
<td>0.471***</td>
</tr>
<tr>
<td>Workload</td>
<td>—</td>
<td>0.160*</td>
<td>0.143*</td>
<td>0.130*</td>
</tr>
<tr>
<td>Fluctuations in load</td>
<td>—</td>
<td>0.222***</td>
<td>0.157*</td>
<td>0.150*</td>
</tr>
<tr>
<td>Control</td>
<td>—</td>
<td>-0.330***</td>
<td>-0.222**</td>
<td>-0.239**</td>
</tr>
<tr>
<td>Support</td>
<td>—</td>
<td>-0.142</td>
<td>-0.041</td>
<td>-0.070</td>
</tr>
<tr>
<td>Time orientation</td>
<td>—</td>
<td>-0.210*</td>
<td>-0.261**</td>
<td>-0.248**</td>
</tr>
<tr>
<td>NA \times workload</td>
<td>—</td>
<td>—</td>
<td>0.036</td>
<td>—</td>
</tr>
<tr>
<td>NA \times fluctuations</td>
<td>—</td>
<td>—</td>
<td>0.143*</td>
<td>—</td>
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<tr>
<td>NA \times control</td>
<td>—</td>
<td>—</td>
<td>-0.206**</td>
<td>—</td>
</tr>
<tr>
<td>NA \times support</td>
<td>—</td>
<td>—</td>
<td>0.221**</td>
<td>—</td>
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<tr>
<td>NA \times time</td>
<td>—</td>
<td>—</td>
<td>-0.275**</td>
<td>—</td>
</tr>
<tr>
<td>Model $R^2$</td>
<td>0.307***</td>
<td>0.265***</td>
<td>0.455***</td>
<td>0.532***</td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.01; ***p < 0.001.
Analyses based on subjects with complete data, $N = 129$.

variables corrected for each other, and thus addresses hypotheses 5 and 3 respectively. Model 4 ('Interactive model') also includes the five (multiplicative) interaction terms, and is the third step in an hierarchical analysis, testing hypothesis 4, the moderation hypothesis. Unstandardized regression coefficients ($B$ values) were determined for each model, such that every term was corrected for all other terms in the equation at that point.

Table 3. Hierarchical regression analysis predicting \textit{job satisfaction} from NA, work demands, fluctuations in workload, social support from senior colleagues, and time orientation

<table>
<thead>
<tr>
<th>Source</th>
<th>Model 1: NA model (step 1-a)</th>
<th>Model 2: Perceived environment model (step 1-b)</th>
<th>Model 3: Additive model (step 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism (NA)</td>
<td>-0.118*</td>
<td>—</td>
<td>-0.055</td>
</tr>
<tr>
<td>Workload</td>
<td>—</td>
<td>0.150*</td>
<td>0.152*</td>
</tr>
<tr>
<td>Fluctuations in load</td>
<td>—</td>
<td>0.002</td>
<td>0.009</td>
</tr>
<tr>
<td>Control</td>
<td>—</td>
<td>0.418***</td>
<td>0.406***</td>
</tr>
<tr>
<td>Support</td>
<td>—</td>
<td>0.283***</td>
<td>0.272***</td>
</tr>
<tr>
<td>Time orientation</td>
<td>—</td>
<td>0.456***</td>
<td>0.462***</td>
</tr>
<tr>
<td>Model $R^2$</td>
<td>0.039*</td>
<td>0.584***</td>
<td>0.587***</td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.01.
Analyses based on subjects with complete data, $N = 130$. 
NA model (step 1-a): testing hypothesis 1
Negative affectivity was significantly associated with GHQ score and job satisfaction. The NA model was significant for both outcome measures: GHQ score, $F(1,128) = 56.62, p < 0.001$; job satisfaction, $F(1,129) = 5.18, p < 0.05$.

Perceived environment model (step 1-b): testing hypothesis 2
The five environmental variables were also significant joint predictors of both outcomes: GHQ score, $F(5,124) = 8.94, p < 0.001$; job satisfaction, $F(5,125) = 35.11, p < 0.001$.

Additive model (step 2): testing hypotheses 3 and 5
In the additive model each outcome was predicted by the simultaneous regression of NA and the four environment variables. Comparing the environment (step 1-b) and additive models, NA was found to add significantly to the prediction of GHQ score ($\Delta R^2 = 0.190, p < 0.001$), but for job satisfaction, the incremental improvement in prediction was negligible ($\Delta R^2 = 0.003, n.s.$). Furthermore, for job satisfaction the predictive power of the environmental variables (as indicated by the $B$ values for each model) was not found to be greatly affected by the inclusion of NA. In contrast, for the prediction of GHQ score a reduction in the size of the regression coefficients associated with each of the environmental variables is noted.

For example, the regression coefficient associated with control was reduced by one-third when NA was included in the regression equation to predict GHQ score. A diagrammatic representation of this confound effect is shown in Figure 2. When considered alone, rather than in the full simultaneous model, the reduction in predictive power of control is sufficient to reduce the significance of the regression coefficient below acceptable levels. It should be noted, however, that this association was not reduced to zero, and must be interpreted as a partial confound only (Cox and Ferguson, 1991). Moreover, even with NA included in the full regression model, associations between the stressor variables and GHQ score remained statistically significant.

The prediction of job satisfaction from the combination of NA and the work environment measures revealed a mediation effect. Although a significant association was observed between NA and job satisfaction in the NA model (model 1), in the Additive model (model 3), which also included the work environment measures, NA was not found to make a significant contribution. More detailed analysis revealed a mediation of the influence of NA through perceptions of control, illustrated in Figure 3. When job satisfaction was regressed onto perceived control and NA, it was the association between NA and satisfaction that was reduced to a level below conventional statistical significance. Thus, whereas NA was found to partially confound (or inflate) the association between perceived control and strain in terms of GHQ score, in the case of job satisfaction, the influence of NA was mediated through perceived control.

Interactive model (step 3): testing hypothesis 4
Expanding upon Parkes’ (1990) analysis, the final step of the hierarchical regression analysis was the introduction of NA cross product terms for each of the work environment measures (workload, fluctuations in demand, control at work, social support from senior colleagues, time orientation), forming the Interactive model (model 4) for each outcome.

The interaction terms, as a block, contributed significantly to the prediction of GHQ score ($\Delta R^2 = 0.77, p < 0.01$), with all but the NA × workload terms making a significant unique contribution. NA was found to be a moderator of the relationship between the perceived work environment and GHQ score. The final model was significant, $F(11,118) = 12.19, p < 0.001$, explaining 53.2 per cent of the variance in GHQ score.

NA was found to act as a vulnerability factor in the stressor–strain relationship, such that
individuals high in NA reacted more poorly to negative features of their work. This occurred in addition to overall higher symptom reports by high NA individuals (the direct effect). To illustrate these effects, the NA × fluctuations and NA × control interactions are presented in Figures 4 and 5 respectively, for the mean level (standardized score equal to zero) for all variables not involved in each interaction (Finney et al., 1984). Values of one standard deviation above and below the mean were taken to represent high and low levels of each variable. From the figures, it may be seen that high NA individuals react poorly to fluctuating workload and low control opportunities; conditions of steady workload (low fluctuations) and high control opportunities reduce impact of high NA. The same pattern was observed for time orientation: high NA individuals who work in

**STEP 1:** In separate analyses, NA predicts both perceived control and GHQ score

\[ B = -.264^{**} \]

\[ \text{NEGATIVE AFFECTIVITY} \]

\[ \text{PERCEIVED CONTROL} \]

\[ B = .541^{***} \]

\[ \text{NEGATIVE AFFECTIVITY} \]

\[ \text{GHQ SCORE} \]

**STEP 2:** Perceived control significantly predicts GHQ score

\[ B = -.278^{**} \]

\[ \text{PERCEIVED CONTROL} \]

\[ \text{GHQ SCORE} \]

**STEP 3:** In a simultaneous analysis with NA, the relationship between perceived control and GHQ score, is found to fall below statistical significance (dashed line).

\[ B = -.264^{**} \]

\[ \text{NEGATIVE AFFECTIVITY} \]

\[ \text{PERCEIVED CONTROL} \]

\[ B = .504^{***} \]

\[ \text{NEGATIVE AFFECTIVITY} \]

\[ \text{GHQ SCORE} \]

\[ B = -.141 \text{ns} \]

\[ \text{PERCEIVED CONTROL} \]

\[ \text{GHQ SCORE} \]

Figure 2. NA partially confounding the relationship between perceived control and GHQ score. The regression coefficients shown here and from analyses including only these three variables, not the full simultaneous analysis. Analyses based on subjects with complete data, \( N = 130 \).

*\( p < 0.05; **p < 0.01; ***p < 0.001 \)
long-term time orientation companies report negligible symptoms of strain. For social support, it was found that low NA individuals derive greater benefit (reduced symptoms) from supportive senior colleagues than high NA employees. Taken together, these findings indicate that high and low NA individuals generally respond to work perceptions in quite distinct ways.

In contrast, the block of interaction terms did not contribute significantly to the prediction of job satisfaction ($\Delta R^2 = 0.027, n.s.$). NA does not play a significant moderator role with respect to job satisfaction. As this step was not significant, $B$ values have not been included in Table 3. The Environment model (model 2), provides a more parsimonious prediction of job satisfaction, explaining 58.7 per cent of the variance.

**STEP 1:** In separate analyses, NA predicts both perceived control and job satisfaction

```
NEGATIVE AFFECTIVITY
  \( B = -0.264^{**} \)

PERCEIVED CONTROL
```

```
NEGATIVE AFFECTIVITY
  \( B = -0.197^* \)

JOB SATISFACTION
```

**STEP 2:** Perceived control significantly predicts job satisfaction

```
PERCEIVED CONTROL
  \( B = 0.355^{***} \)

JOB SATISFACTION
```

**STEP 3:** In a simultaneous analysis, the relationship between NA and job satisfaction, is (partially) mediated through perceptions of control; relationship between NA and satisfaction reduced to below statistical significance (dashed line).

```
NEGATIVE AFFECTIVITY
  \( B = -0.264^{**} \)

PERCEIVED CONTROL
  \( B = 0.324^{***} \)

JOB SATISFACTION
  \( B = -0.112 \text{ns} \)
```

Figure 3. Impact of NA on job satisfaction, partially mediated by perceptions of control. The regression coefficients shown here are from analyses including only these three variables, not the full simultaneous analysis. Analyses based on subjects with complete data, $N = 131$. $^* p < 0.05$; $^{**} p < 0.01$; $^{***} p < 0.001$
Figure 4. Moderating (vulnerability) effect of NA on fluctuations in workload. ——— High NA; --- low NA

Figure 5. Moderating (vulnerability) effect of NA on perceptions of control. ——— High NA; --- low NA
Further analyses: Other individual differences as predictors of strain

Many other individual difference variables, besides NA, have been implicated in the stress process. It was therefore considered important to establish that the inclusion of such variables did not affect the findings of the present analyses. Demographic variables of age, gender, level of education and marital status have been shown to be predictive of satisfaction and symptom report in published studies (e.g. Parkes, 1990; Ranchor and Sanderman, 1991). Thus a further analysis was conducted for each of the outcome measures, in which the four demographic variables were entered as a preliminary block, prior to the hierarchical regression analyses described above. However, this block did not significantly predict either outcome ($R^2_{\text{satisfaction}} = 0.040 \ n.s.; \ R^2_{\text{GHQ-score}} = 0.035 \ n.s.$), nor did control for these variables significantly alter the contributions of the other terms as described above.

Furthermore, it has been suggested that the individual difference ‘positive affectivity’ (PA) might act to confound positively toned self-report scales, such as job satisfaction, in a way that parallels the influence of NA on negatively toned scales like symptom report (e.g. Burke et al., 1993; Schaubroek and Ganster, 1991). Therefore the same statistical treatment as described here for NA was used to examine the potential roles of PA in influencing job satisfaction and symptom report.\(^2\) Although extroversion was found to be significantly correlated with job satisfaction, this trait did not make a significant unique contribution once the environmental variables were added into the model the influence of PA on job satisfaction was an indirect one, mediated through perceptions of the work environment. PA was not found to be significantly associated with level of symptom report. The potential moderating influence of PA was also tested: for neither job satisfaction, nor symptom report was the PA interaction block found to add significantly to the additive model.

Discussion

The present study contributes to the understanding of the stress process in two ways. Firstly, it is apparent that no single pathway or mechanism accounts exclusively for the impact of NA on stress outcomes. Rather, the process is a complex one with four possible pathways, all of which were demonstrated in the present study. Secondly, it has been shown that the different strain outcomes, specifically job satisfaction and symptom report, are predicted by different models of the stress process, and not by a single general model.

The intercorrelations among negative affectivity, stressors and strains

Negative affectivity was found to be correlated with both outcome measures, and with two of the four work environment measures, offering a partial support for hypothesis 1. Symptom report and job satisfaction were also correlated to different degrees with the work environment measures, and in addition several of the work environment measures were correlated with each other. However, although job satisfaction and symptom report were significantly and negatively correlated, the strength of their relationships to the other measures were quite distinct, and not merely the inverse of one another (in agreement with Evans et al. (1993) and Steptoe (1989)). In particular, symptom report showed a much closer association with NA than did job satisfaction: report of symptoms was significantly correlated with NA, workload, fluctuations in workload, lack of control at work, and low social support from superiors. In contrast, job satisfaction was correlated with low NA,

\(^2\) PA was measured using the 12-item extroversion scale of the EPQ-R (Eysenck et al., 1985).
high control at work, high support from superiors, and long-term time orientation of the company.

The relationship between stressors and strains

Both job satisfaction and symptom report were significantly predicted by the joint influence of the work perception measures, thus supporting hypothesis 2. With respect to the individual contributions made by each of the environment measures, some differences may be noted. Job satisfaction was predicted by high levels of support, control, workload and time orientation: fluctuations in workload did not contribute to the prediction of job satisfaction. Symptom report, in contrast, was predicted by low levels of control, high workload, high fluctuations in workload, and short-term time orientation. These findings are generally consistent with the literature as outlined in the Introduction.

One unpredicted correlation should however be noted, namely the positive correlation between workload and job satisfaction. That is, work demands were a positive job feature in the model. An explanation for this effect was found in follow-up analyses, which examined some further individual differences. The relationship between work demands and job satisfaction was confounded by locus of control, such that people with an internal locus of control were found to report higher job satisfaction and higher work demands. Once locus of control was controlled, this association was reduced to below accepted significance levels. 3

NA as a confound

There was some evidence that NA acted as a nuisance variable by inflating correlations between self-report of environment and outcome variables, as reported by Brief et al. (1988) among others. This role of NA can only occur when NA is found to predict both the independent and dependent variables. However, Table 1 indicates that NA is not highly correlated with all measures of the work environment; therefore NA cannot generally account for observed correlations between work environment measures and strain.

Furthermore, when NA was statistically controlled in the regression analyses (model 3), work environment-strain relationships were only substantially reduced for the prediction of GHQ score and in no case was total confounding (reduction to zero) observed. Moreover, there was no evidence of NA confounding the relationship between work environment measures and job satisfaction. This differential confounding effect, dependent upon outcome, is also consistent with findings outlined in the Introduction (Chen and Spector, 1991; Burke et al., 1993; Schaubroek and Ganster, 1991; Schaubroek et al., 1992; Terry et al., 1993), and supports hypothesis 3.

Mediated effect of NA

Comparison of the models 1 (NA model) and 3 (Additive model) as nested steps in an hierarchical regression analysis showed that the first-order term for NA was not a significant predictor of job satisfaction, once other independent variables were included in the equation. This implies that there is a mediated pathway through work environment measures, specifically perceptions of control. High NA individuals reported lower control opportunities at work, which in turn have implications for job satisfaction (represented diagrammatically in Figure 3).

It may be that NA acts to colour perceptions of the work environment or, alternatively, it may

3 Locus of control was measured with the 16-item Work Locus of Control Scale (Spector, 1988).
be that high NA individuals select, are placed in, or create work roles that have objectively fewer opportunities to exert control (Watson et al., 1987). Furthermore, no such pathway was evident in the prediction of symptom report, thus replicating the findings of Levin and Stokes (1989) and Terry et al. (1993): thus hypothesis 5 was supported. Moreover, the closer relationship of control with job satisfaction than with symptom report is consistent with findings reported elsewhere (e.g. Jackson, 1989; Ganster, 1989; Sauter, 1989). The exact mechanism through which control at work mediates the influence of personality would merit examination in future research. For example, use of objective work environment measures in addition to perception scales, would allow the relationship between objective and subjective control measures to be examined, and any influence of NA on this relationship to be considered.

NA as a moderator, or vulnerability factor

Evidence that NA plays a moderator role was found for the prediction of symptom report: the NA interaction block as a whole made a significant contribution to the prediction of well-being, but not job satisfaction. Inspection of Figures 4 and 5 shows that low NA individuals generally experienced few symptoms (the direct effect), and that for them, symptom report was not significantly related to work demands and constraints (a buffering effect); low NA individuals did however benefit from the support of their senior colleagues. In contrast, high NA individuals showed higher symptom levels (a vulnerability effect) with fluctuating workload, low control, and low future and quality orientation (time orientation); furthermore, they did not derive the benefit from social support that was obtained by their low NA counterparts.

These interactions are of a form consistent with that reported by Parkes (1990) between general work demands and NA. The failure to replicate Parkes’ NA × workload interaction in the present study requires further investigation. One plausible explanation may lie in the fact that the present sample did not show the direct association between workload and symptom report that has been found in research with other populations. Furthermore, the work characteristics scales used in the present study included other aspects of work demands (namely quality and workload fluctuations), which may be more salient to this group of employees. That NA was not found to be a significant moderator of work environment stressors in the prediction of job satisfaction, is a replication of Levin and Stokes (1989). Taken together, these findings support hypothesis 4.

Specificity of stress model according to outcome: a summary of findings

Focusing on the prediction of the two different types of outcome through hierarchical multiple regression, it is very clear that symptom report and job satisfaction do not represent opposite ends of some generalized 'strain' dimension: each outcome was predicted by quite different combinations of independent variables. An additive model, including only work environment terms, provided the best prediction of job satisfaction. The role of NA in the prediction of job satisfaction was limited to an influence mediated by work environment measures. In contrast, GHQ score showed significantly improved prediction with the addition of both the NA first order term, and the block of NA × work environment product terms. Negative affectivity was thus seen to have a dual role in the prediction of symptom report, with high NA individuals generally experiencing poorer well-being and, in addition being more vulnerable to environmental stressors than their low NA counterparts. The practical implication of these findings is that different strain indices cannot necessarily be improved through the same mechanisms. Rather than simply aiming to reduce 'stress' or 'strain', one needs to select the desired outcome (e.g. job satisfaction, anxiety, physical health) and examine the model that describes the aetiology of that specific outcome.
Conclusions regarding the roles of negative affectivity

The results presented here indicate that NA is an important factor to be included in stress research. NA was implicated in the stress process through all four possible pathways, though not simultaneously for any single outcome. Although NA may act as a nuisance variable by confounding self-report measures of stressors and well-being, controlling for NA revealed that this was only a partial confounding effect. Albeit attenuated, significant relationships between the work environment measures and GHQ score remained with NA included in the regression analysis as a covariate. This finding is consistent with Brief et al. (1988), but does not support the more extreme view that NA underlies all correlations between self-reports of stressors and strains (e.g. McCrae, 1990; Watson et al., 1987). Furthermore, the confounding role was found to be of relevance only to the prediction of symptom report, and not the affective measure of job satisfaction.

Although job satisfaction was significantly predicted by NA alone (model 1), the additive term for NA was not significant when work environment measures were also included in the model (model 3). NA does not account for relationships observed between work stressors and low job satisfaction. This finding also contradicts the arguments of Watson, McCrae and their colleagues, who suggest that high NA individuals will report negatively about all aspects of their environment, whether it is stressful or not. The only role of NA in the prediction of job satisfaction was one mediated through perceptions of control at work.

The moderator and mediator roles have been neglected in most stress research: simple use of first-order terms in multiple regression analyses does not fully capture the predictive power of this trait. In addition to controlling for NA in order to address the confound issue, future research should also routinely investigate the moderating and mediating pathways.

Finally, returning to the conceptual framework of the stress process described in the Introduction, it can be argued that any individual difference variable could operate through the four pathways described here for NA. Systematic examination of all the potential modifying roles of traits such as positive affectivity, locus of control, hardiness, and Type A behaviour in the stress process could provide important contributions to a deeper understanding of the influence of personality in the stress process.

Limitations of the current study and suggestions for future research

The current study was not designed to provide a definitive test of models of the stress process, nor even the prediction of job satisfaction and symptom report. It was intended to demonstrate that NA can operate through several alternate (though not necessarily competing) pathways to influence two commonly used indices of strain. To maintain the focus, many constructs that are also potentially influential in these processes have been omitted. Additional work factors of relevance might include role conflict and ambiguity (Rizzo, House and Lirtzman, 1970), support from co-workers and non-work sources (House, 1981), as well as objective or independent measures of workload and content. Similarly, although some additional individual differences were controlled in follow-up analyses, this list was not exhaustive: Type A personality, psychological hardness, achievement motivation, and general ability might also usefully be examined in this context.

There are several more specific limitations of the present study, including a relatively small sample size and the use of some measures that are not well developed, specifically the fluctuations in workload scale, and in time orientation scale. These two factors result in relatively low statistical power of the analyses, particularly for interaction effects, and hence the possibility that real effects may not have reached statistical significance (Busmeyer and Jones, 1983). The fact that these two
scales were found significantly to predict outcomes, despite quite low internal consistency, suggest that these constructs warrant further examination, and hence improved measures should be developed. In addition, the use of volunteer subjects with a limited range of occupations has resulted in a participant group that is not representative of the general population. Follow-up of part of the respondent sample suggested that volunteers were more likely to be female, with lower perceived workload, and higher levels of social support. Thus the present study requires replication with different occupational groups; a larger total sample would also allow the investigation of a greater number of potentially influential variables.

As with much research in this area, the causal inferences drawn are based on theoretical rather than empirical grounds. In all models presented, traits (specifically NA) are presumed to precede the work context, which in turn precedes affective and physical outcomes, and hence this is the presumed direction of causality. Longitudinal research, particularly if combined with independent data sources, would allow an investigation of the validity of these assumptions, and hence lead to a more detailed understanding of these different processes.

The reason why job satisfaction and symptom report are predicted by different models warrants more detailed investigation. It may be that low satisfaction represents a different type of strain outcome (i.e. affective rather than physical), or alternatively, this finding could be an artefact of the positive wording of the job satisfaction scale, as has been recently suggested (Schaubroek et al., 1992; Burke et al., 1993). To test the hypothesis that only negatively worded scales are susceptible to contamination by NA requires the construction of negatively worded or balanced job satisfaction scales, to allow comparison with the currently used positively worded scales. Similarly, measures other than negatively-toned symptom checklists should be used to gauge physical and mental health. Finally, having demonstrated that the role of NA differs for the prediction of job satisfaction and symptom report, it would be logical to investigate the role of NA in the prediction of other strain indices, such as specific mental health measures (e.g. anxiety, depression), physical health, absence from work, and work performance.

References


