EFFECTS OF JOB DEMANDS, CONTROL AND SUPPORT ON PSYCHOLOGICAL AND WORK-RELATED WELL-BEING IN A SAMPLE OF GREEK BLUE-COLLAR WORKERS

Introduction

Beehr & Newman (1978: 670) define occupational stress as «a situation wherein job-related factors interact with a worker to change (i.e. disrupt or enhance) his or her psychological and/or physiological condition such that a person is forced to deviate from normal functioning». The definition indicates that occupational stress results in a deviation from a healthy psychological and physiological state to an unhealthy one. Many variables have been hypothesized to impinge upon the relationship between occupational stress and well-being. In particular, cognitive demands (Wall, Jackson & Mullarkey, 1995), control (Karasek, 1989; Spector, 1986) and social support (House, 1981) are thought to influence the occupational stress process by either having a direct effect on well-being or by acting as buffers of the effect of stress on well-being.

One of the most influential and widely researched models in the study of occupational stress is the demand-control model of the psychosocial work environment (Karasek, 1979; Karasek & Theorell, 1990). Its transactional nature indicates that the stress process is a continual transaction between external demands, external supports, personal resources and needs as the individual tries to maintain balance (Cox & MacKay, 1981).

The model postulates that the two main constructs that determine the individual’s health in the work environment are job demands and job control. Job demands are defined as psychological stressors and the model states that the stress-related outcomes are mainly related to the psychological effects rather than to the physical effects of workload (Karasek & Theorell, 1990; Van der Doef & Maes, 1999; de Jonge, van Vegchel, Shimazu, Schaufeli & Dormann, 2010). Job control or decision latitude has two components: the worker’s authority
to make decisions on the job [decision authority] and the breadth of skills that are used by the worker on the job [skill discretion] (Härter Griep, Rotenberg, Vasconcellos, Landsbergis, Comaru & Alves, 2009). An additional dimension of job conditions that has emerged during the studies on the demand–control model is the dimension of social support. The model was therefore expanded to include a third construct, the construct of social support (Johnson & Hall, 1988; Johnson, Hall & Theorell, 1989). The above led to the so-called iso-strain hypothesis which postulates that the highest stress is expected in jobs where demands are high, but both perceived job control and social support are low (Van Der Doef & Maes, 1998; Vanroelen, Levecque & Louckx, 2009).

The demand–control model has two distinct hypotheses. According to the job strain hypothesis, jobs that are characterized by both high demands and low control [labeled as high-strain jobs] will produce strain (de Jonge et al., 2010). At the opposite direction, jobs with low demands and high control are labeled as low strain jobs (Karasek, Brisson, Kawakami, Houtman, Bongers & Amick, 1998) and are associated with reduced strain. The second major hypothesis, known as the active learning hypothesis, states that in jobs where both demands and control are high, the individual will demonstrate increased motivation as well as personal development (de Jonge & Kompier, 1997). Those jobs are therefore labeled as active jobs and are characterized as the ideal work situation (Dalgard, Sørensen, Sandanger, Nygård, Svensson and Reas, 2009). In contrast, jobs that are characterized by low levels of demands and control are labeled as passive jobs and are generally associated with dissatisfaction.

The most intriguing, however, hypothesis of the model is the buffering hypothesis, also known as the interactive hypothesis. It states that high job demands may lead to strain only when the individual has low controllability over his work. The above indicates that job control acts as a buffer to the detrimental effects of high demands on well-being (Butler, Grzywacz, Bass and Linney, 2005; Shimazu, de Jonge & Irimajiri, 2008). As a result, it is the interaction between job demands and job control that is important in the prediction of employee well-being. In addition, the construct of social support has been hypothesized to have the same buffering effect and was therefore included in the expanded demand–control–support model (Johnson & Hall, 1988). It should be noted that the job strain and the active learning hypotheses imply additive effects of job demands and job control whereas the buffering hypothesis implies interactive effects of the two constructs (Vanroelen et al., 2009).

Due to its simplicity and broad applicability the demand–control model has been employed in a considerable number of studies – both epidemiological
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[multi-occupational] and self-reports based on specific occupational groups – examining cardiovascular disease, cardiovascular risk factors, anxiety, depression, fatigue, distress, occupational accidents, absence from work and psychiatric disease (Kristensen, 1995).

The epidemiological studies were mainly focused on cardiovascular diseases and used objective measures of job demands, job control and strain (e.g. Alterman, Shekelle, Vernon & Burau, 1994). Ganster & Schaubroeck (1991) observed that the above-mentioned studies which used a diversity of occupations were more supportive of the interactive hypothesis than the self-report studies (Fox, Dwyer & Ganster, 1993; Parkes, Mendham & von Rabenau, 1994). Karasek (1989) noted that homogeneity in the sample is associated with limited variance in the independent measures and therefore the interaction test is conservative. On the other hand, it has been argued (Ganster & Fusilier, 1989) that multi-occupational studies do not take into account the variability in job characteristics within occupations. Indeed, several authors (de Jonge & Kompier, 1997; Sparks & Cooper, 1999) highlighted the fact that interactive effects are less likely to be detected in large heterogeneous samples due to the tension between the diversity of occupations and the diversity in job characteristics (de Jonge, van Breukelen, Landeweerd & Nijhuis, 1999). In addition, it has been noted (Landsbergis, Schnall, Schwartz, Warren & Pickering, 1994) that studies at the occupation-level have not explicitly tested the interaction of job demands and job control since the main effects of those variables were not controlled for, thus the tests of the interaction effects were inappropriately liberal. Furthermore, Fox et al. (1993) suggested that elements such as socio-economic status may have confounded the results as they affect health and longevity. Additionally, individuals of low socio-economic status are more likely to be employed in jobs with high demands and low control (Schaubroeck & Merritt, 1997).

The self-report studies that tested the demand–control model were based on relatively homogeneous samples of a single occupation such as teachers (van der Doef & Maes, 2002), steel pipe mill workers (Perrewe & Antony, 1990), electrical workers (Spector, 1987), correctional officers (Brough & Williams, 2007) and nurses (Hurrell & McLaney, 1989; Hollman, Heuer & Schmidt, 2001). Those examined different outcomes such as satisfaction, work motivation, absence from work, blood pressure, emotional exhaustion, anxiety, depression and muscle tension (De Jonge et al., 1999; Häusser, Mojzisch, Niesel & Schulz-Hardt 2010). Evidence for the interactive hypothesis is also mixed in those studies. Landsbergis (1988) provided support
of the interaction in the prediction of affective outcomes in a study of health care workers and Fernett, Guay & Senecal (2004) have found interactive effects of demands and control on emotional exhaustion, in a sample of university professors. On the other hand, other researchers (Hurell & McLaney, 1989; Spector, 1987; Griffin, Greiner, Stansfield & Marmot, 2007) have failed to provide support of the interactive hypothesis in the prediction of outcomes such as anxiety, depression, somatic complaints and job satisfaction.

Spector (1987) concludes that homogeneous samples with respect to occupation provide a more adequate test of the demand–control model as several confounding variables (e.g. socio-economic status) can be accounted for. This is further supported by the finding that large-scale studies which control for the level of the job do not report any significant interactive effects of demands and control (Karasek, Baker, Marxer, Ahlbom & Theorell, 1981; Reed, LaCroix, Karasek, Miller & MacLean, 1989). Moreover, Ganster & Fusilier (1989) argued that since the presumption of variability in job characteristics is the basis for stress interventions (e.g. through job redesign), it is important that the demand – control theory is able to predict differences in the level of strain between individuals within the same occupation.

Both cross-sectional and longitudinal studies that tested the demand–control model have been carried out. Van der Doef & Maes (1999) in their review article of mainly cross-sectional studies of the model concluded that although there was considerable support for additive effects of demands, control and support on strain, support for the interactive hypothesis was weak. In particular, only 30 out of 78 studies found partial support for the hypothesized multiplicative interaction (Dalgard et al., 2009). Similarly, in a more recent review article of the demand–control model, Häusser et al. (2010) pointed out that there is limited support for the buffering hypothesis. Longitudinal studies that test the model are less frequently employed. In their review of longitudinal studies on the demand – control model, de Lange, Taris, Kompier, Houtman, & Bongers (2003) point out that very few longitudinal studies have provided support for interactive effects.

**Rationale of the study**

The general lack of support for the buffering hypothesis has raised considerable criticism and discussion (de Jonge & Kompier, 1997; Kasl, 1989; Carayon, 1993; Beehr, Glaser, Canali & Wallwey, 2001). Wall, Jackson, Mullarkey & Parker (1996) have put forward several
methodological considerations concerning the demand–control model. They argued that the conceptualization of its two key constructs, job demands and job control, is too vague. Different researchers have conceptualized job demands as workload (Fox et al., 1993), as interpersonal conflicts (Spector, 1987) or as time pressure due to a heavy workload (Fernet et al., 2004; Karasek & Theorell, 1990). In addition, Karasek’s (1979) original scale included items that were not purely descriptive but had an affective component that reflected the employees’ perception of the stressfulness of the job. According to Wall et al. (1996) this may lead to spurious relationships between job demands and psychological strain and hence will restrict the opportunity to demonstrate any underlying interaction between job demands and job control. In support of the above, studies that provided support for the interactive hypothesis did not use any affective items. Dwyer & Ganster (1991) found significant interactions when they measured job demands through job analysis, therefore removing the possibility of affective bias. Similarly, Parkes, Mendham & Von Rabenau (1994) controlled for affectivity in their statistical analyses and reported interactive effects of job demands and job control. Wall et al. (1996) recommended the use of purely descriptive items for the measurement of job demands, focused on the cognitive requirements of the job.

Furthermore, as previously noted, the original construct of decision latitude (Karasek, 1985) has two components: decision authority and skill discretion. Fernet et al. (2004) argued that it is the component of decision authority rather than the skill discretion component that is more closely linked to job control (De Bruin & Taylor, 2006). In agreement with the above, Wall et al. (1996) recommend the use of a measure of job control that focuses mainly on the decision authority component. In their study they were able to demonstrate the interaction effect when they used a more focused measure of job control, namely timing control and method control.

The primary aim of the present study was to test the strain and the buffer hypothesis of the demand–control model, with several improvements over prior methodologies. Thus, the model was re-examined following Wall et al.’s (1996) recommendations, using a descriptive measure of job demands and a more focused measure of job control. The dimension of social support was also included in the study and control and support were combined in order to represent the resources available to the individual. Finally, the study used a relatively homogeneous sample of blue collar workers. This reduced the possibility of confounding of socio-economic status, but maintained enough variability in job characteristics. Indeed, it has been
argued that it is the variation in exposure rather than the representativeness of the sample that is a contributing factor in the support of the model (Kristensen, 1995; de Jonge and Kompier, 1997).

**Research Methodology.**

**Participants and Procedure**

The present study was conducted in a medium-sized Mining Company in Greece. The initial sample consisted of 190 participants and was relatively homogeneous as the participants were mainly blue-collar workers and male. The questionnaires were distributed during normal working hours by the researcher and two foremen. The participants were assured strict confidentiality and the questionnaires were collected immediately after their completion. From the initial 190 questionnaires that were distributed, 168 were returned to the researcher and the 145 were in a usable form. The participants were working in the following sectors of the Company: production, which includes surface and underground mining, maintenance and processing. Underground production involves tunneling and extraction of bauxite and workers in this section are drilling machine operators, chargers, loader operators and underground truck drivers. In the underground mining, mechanization in all phases of work is almost complete. Supervisors and foremen as well as workers involved in roof-bolting are supporting the underground production. The same working activities are involved in the surface production. The second major sector is processing, which involves screening, crushing and loading of bauxite and beneficiation of the material. Machine operating and truck driving are the main working activities in this sector. The workers involved in maintenance are repairers and people responsible for the maintenance of the machines.

**Measures**

**Job characteristics**

Job characteristics were measured using the scales developed by Jackson, Wall, Martin & Davids (1993) for the manufacturing industry. In particular monitoring demands which refer to the extent of passive monitoring required on the job were measured by four items. Problem solving demands reflect the more active, cognitive processing required to prevent or recover errors and were measured by three items. Production responsibility is a measure.
of the cost of errors in terms of both lost output and damage to expensive equipment and was represented by five items.

The scales consisted of solely descriptive items such as «Does your work need your undivided attention?» and «Do you have to solve problems which have no obvious correct answer?». Workers were required to answer on a five-point response scale and the response alternatives were labeled: not at all [1], just a little [2], a moderate amount [3], quite a lot [4], a great deal [5]. A total score was obtained by averaging item scores with higher values representing greater demand. The internal reliabilities (Cronbach’s $\alpha$) of the scales were above .70 with the exception of the problem-solving demand scale which consistently showed a value of $\alpha$ of around .50.

**Job control** was measured using Jackson et al.’s (1993) scales. **Timing control** refers to the individual’s opportunity to determine the scheduling of his or her work behavior and was measured by four items. **Method control** refers to the individual choice in how to carry out given tasks and was measured by six items.

All the above items were focused clearly on control itself and did not encompass elements such as skill use and task variety which are characteristics of the decision latitude measures (Wall et al., 1996). The response scale and score was the same with the demands scales described above. The internal reliabilities (Cronbach’s $\alpha$) of the scales were above .80 (Jackson et al., 1993).

**Support** was measured by four items, with two items measuring co-worker support and two items measuring technical support.

**Work feelings.**

Subjective strain was measured using a set of 12 items based on Warr’s (1990) analysis and Watson and Tellegen’s (1985) varimax rotation solution of mood items as positive and negative affect (Hockey, Payne & Rick, 1996). The positive affect dimension was reversed to emphasize depression and fatigue rather than alertness and affect items were chosen to emphasize short-term responses to work. The negative affect dimension was similarly modified to reflect anxiety. Scale reliabilities of the above measures are acceptable (Cronbach’s $\alpha$ for anxiety = .78, depression = .88, fatigue = .83).

The fatigue items were: [high] tired, fatigued; [low] full of energy, lively.

The anxiety items included: [high] tense, anxious; [low] relaxed, at ease.

The depression items were: [high] fed-up, depressed; [low] optimistic, enthusiastic.

The items were arranged in such a way that no more than two successive
items referred to anxiety, fatigue or depression. A nine-point response scale was used, ranging from «I never feel like this» to «I always feel like this». Mean fatigue, anxiety and depression scores were obtained by averaging the four items of each dimension [with reverse scoring for «low» items]. On the basis of reliability check (Cronbach’s α) of the scales, the reversed items of anxiety, depression and fatigue were removed.

**GHQ-12**

The measure of distress was a standardized screening instrument devised for assessing the probability of minor psychiatric disorder through self-report. This was the General Health Questionnaire, a measure which has high validity and reliability in community investigations. The 12-item version of the General Health Questionnaire (GHQ-12, Goldberg & Williams, 1988) was employed, which has been shown to be acceptable and useful in occupational research (Jackson et al., 1993). Reliability coefficients for GHQ have ranged from .78 to .95 (Jackson, 2007). Items were rated on a fully-anchored four-point response scale, ranging from «not at all» [1], to «most of the time» [4]. A total score of general well-being was derived by averaging the 12 items after reversing the appropriate ones. High scores on this scale indicate poor levels of well-being.

**Minor health complaints.**

Thirteen items were derived from the SMU Health Questionnaire (Watson & Pennebaker, 1989) in order to measure minor health complaints (e.g. cold/flu symptoms, aches and pains) with the inclusion of cognitive symptoms. The reliability coefficient for the factor-analytically derived 13-item SMU Health Questionnaire symptom scale was .72. The subjects were asked to indicate whether they had experienced the symptoms over the previous week. A three-point response scale was used, ranging from: not at all [1] to: a lot [3]. All items were summed to give a score of health symptoms.

**Job satisfaction.**

Warr, Cook and Wall’s (1979) job satisfaction scale – an instrument with well-established psychometric properties – was used in the present study. Ten items of the scale were included, five of which measured intrinsic job satisfaction, three measured working conditions extrinsic satisfaction and two items represented employee relations satisfaction. A five-point response scale running from «very dissatisfied» to «very satisfied» was used.
Total scores are the average of the item scores with higher values representing greater satisfaction. The internal reliability (Cronbach’s $\alpha$) of the scale is very good ($\alpha = .90$). Internal reliability for intrinsic job satisfaction is $\alpha = .86$ and for extrinsic job satisfaction is $\alpha = .80$ (Warr et al., 1979).

In addition, individuals were asked to indicate their age and marital status (sociodemographic factors). Finally, in order to control for the effects of previous health, the questionnaire included two questions regarding general health status of the workers. In particular they were asked to indicate how often they visited their GP (General Practitioner) over the past year, and whether they had any serious medical health problems over the past two years.

All questionnaires were translated from English to Greek by an independent translator who followed the translation-back translation procedure (van de Vijver and Hambleton, 1996). The Cronbach’s alpha reliability coefficients for the Greek data are reported in Table 1.

Results

Table 1 shows the Cronbach’s alpha reliability coefficients, mean values, standard deviations and inter-correlations of all the study variables.

**Reliability analysis.**

Most of the scales reached acceptable levels of reliability, with Cronbach’s alpha coefficient being above .6. The only exceptions were the anxiety, depression and fatigue scales that have consistently shown low alpha values, even after the removal of the reversed items on the scales. This may be due to the small number of items of the scales. Pallant (2001) noted that when the scale is short, having less than 10 items, it is not uncommon to find quite low Cronbach’s alpha values such as .50. In addition, the problem-solving demand scale has shown a low alpha value of .45 that calls for further development of the scale (Jackson et al., 1993). Wall, Jackson & Mullarkey (1995) recommend the five-item version of this scale for future use.

**Correlation analysis.**

Results indicated strong correlations among most of the stressors (demands), the resources (control, support) and the outcome variables (anxiety,
depression, fatigue, job satisfaction, GHQ measures, minor health complaints) as expected.

There are several features of the zero-order correlations which are of interest. Overall, the demands measures, rather surprisingly, showed positive correlations with job satisfaction and negative correlations with some of the strain variables. This finding is incongruent with theory since demands are traditionally perceived to reflect negative aspects of the job such as the complexity of the job. In particular, monitoring demands has shown strong negative correlations with GHQ \( (r = -.40, p < .01) \), minor health complaints \( (r = -.37, p < .01) \) and fatigue \( (-.23, p < .01) \) and production responsibility correlated negatively with fatigue \( (r = -.22, p < .05) \), GHQ \( (r = -.30, p < .01) \), minor health complaints \( (r = -.34, p < .01) \) and job satisfaction \( (r = .21, p < .05) \) indicating beneficial effects of demands and suggesting – in the case of monitoring demands and fatigue – that the active monitoring required on the job increases alertness. Implications of the above unexpected findings will be discussed later.

Both measures of job control showed strong correlations with all of the strain variables apart from anxiety. Specifically, method control correlated negatively with depression \( (r = -.21, p < .05) \), fatigue \( (r = -.32, p < .01) \), GHQ \( (r = -.28, p < .01) \) and minor health complaints \( (r = -.36, p < .01) \) and positively with job satisfaction \( (r = .35, p < .01) \). It seems clear that when individuals are given the choice on how to carry out tasks involved in their job, they experience less strain and consequently feel more satisfied. Timing control showed strong negative correlations with fatigue \( (r = -.30, p < .01) \) and minor health complaints \( (r = -.42, p < .01) \) and strong positive correlation with job satisfaction \( (r = .41, p < .01) \), suggesting that when given the opportunity to determine the scheduling of his own work, the individual feels less fatigued, experiences less illness symptoms and is more satisfied.

Finally, support was strongly correlated with most of the outcome variables in the predicted direction. Strong negative correlations of the above variable with fatigue \( (r = -.20, p < .05) \), GHQ \( (r = -.30, p < .01) \) and minor health complaints \( (r = -.33, p < .01) \) and a strong positive correlation with job satisfaction \( (r = .39, 0 < .01) \) indicated that when individuals have support from their co-workers they experience less strain and psychological distress and feel more satisfied in their job. The above is in line with previous research that suggests that social support is generally associated with well-being.
Table 1: Cronbach’s α, descriptive statistics (Mean, SD), intercorrelations (Pearson’s r) for all the study variables

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<th>MDEM</th>
<th>PSDEM</th>
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<th>ANX</th>
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<th>HCOM</th>
<th>JSAT</th>
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* p < .05; ** p < .01
Hierarchical moderated regression analysis

It has been argued (Aiken & West, 1991) that interactions ideally should be tested with moderated regression analysis. This procedure has been recommended as the most appropriate method for testing main effects and interactions when the independent measures are continuous (Bromet, Dew, Parkinson & Schulberg, 1988; Cohen & Cohen, 1983). Therefore, the data obtained from the present study were analyzed with hierarchical moderated regression analysis.

Monitoring demand, problem solving demand and production responsibility were combined to produce one measure of job demands. Similarly, timing control and method control were combined to produce one measure of job control. Perceived control and social support were combined in the present study in order to represent a higher order moderating factor which has been called resources, as has been done by Hockey et al. (1996) in their study of junior doctors. Similarly, Melamed, Kushnir & Meir (1991) considered control and support as psychosocial resources and examined their joint effects in the context of the demand - control model, in a sample of female social workers.

The two variables were grouped based on theoretical grounds as well. Both control and support are considered to be beneficial to the individual and there is ample evidence indicating their positive effects to well-being. As noted before, after its initial articulation the model was expanded by the inclusion of social support as a third dimension (Johnson & Hall, 1988; Kristensen, 1995), thus adding a social dimension to it.

The regression procedure was carried out in five steps. The first two steps involved controlling for background variables. Thus, in the first step of the analysis, the variables of age and marital status (dummy coded) were entered in order to control for their effects. In the second step, visits to GP and serious medical health problems were entered, in order to control for their effects as well. The remaining three steps, following standard analytical procedure, consisted of entering the demand variable (main effect), the resources (control, support) variable (main effect) and finally the relevant cross-product term (demands x resources: interaction effect). All variables were standardized as a precaution against problems of multicollinearity associated with hierarchical moderated regression (Finney, Mitchell, Cronkite & Moos, 1984).

The forms of the interactions. As the findings established the presence of two interaction effects between demands and resources on indices of strain, the next issue to be addressed was to test whether the interactions
were of the form predicted. The form of the interaction was plotted following the procedures recommended by Jaccard, Turrisi & Wan (1990).

In terms of the outcome variable of anxiety, results indicated no main effects of demands or resources on this particular measure. However, results indicated an interactive effect of demands and resources on anxiety ($\beta = -.191$, $p < .01$). In particular, the interaction of demands and resources was found to account for a significant variance in anxiety ($\Delta R^2 = 0.033$, $F$ change = 4.313). The above is consistent with Karasek's model as it indicates that the interaction of demands and resources reduces anxiety. Figure 1 shows the changes in anxiety in relation to demands and resources. Demands are associated with an increase in anxiety under conditions of low resources. On the other hand, when resources are high, an increase in demands is associated with a reduction in anxiety.

**Table 2: Summary of the moderated regression analysis – Anxiety**

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>Beta</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
<td>.029</td>
<td>.029</td>
<td>.150</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Age.</td>
<td></td>
<td></td>
<td>.04</td>
<td>ns</td>
</tr>
<tr>
<td>2.</td>
<td>Medical problems</td>
<td>.042</td>
<td>.042</td>
<td>-.076</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Visits to GP</td>
<td></td>
<td></td>
<td>.063</td>
<td>ns</td>
</tr>
<tr>
<td>3.</td>
<td>Demands</td>
<td>.045</td>
<td>.003</td>
<td>.055</td>
<td>ns</td>
</tr>
<tr>
<td>4.</td>
<td>Resources</td>
<td>.058</td>
<td>.013</td>
<td>-.129</td>
<td>ns</td>
</tr>
<tr>
<td>5.</td>
<td>Demands x Resources</td>
<td>.091</td>
<td>.033</td>
<td>-.191*</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized $\beta$ weights for each step of the analysis

* $p < .05$  ** $p < .01$  *** $p < .001$

In the examination of the depression variable, the background variables account for only 5% of the variance in depression ($R^2 = .048$, $F = 1.528$). A finding worth-mentioning is the significant effect of the background variable of visits to GP on depression ($\beta = .203$, $p < .05$). This suggests that visits to GP may be a major predictor of depression. However, the effects of this variable have been controlled for. The main effects of demands and resources accounted for only 8% of the variance in depression ($R^2 = .076$, $F = 1.609$) and were not statistically significant. Results indicated no interactive effects of demands and resources on depression.
Table 3: Summary of the moderated regression analysis - Depression

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
<th>Beta</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
<td>.006</td>
<td>.006</td>
<td>-.027</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td></td>
<td>.082</td>
<td>ns</td>
</tr>
<tr>
<td>2.</td>
<td>Medical problems</td>
<td>.048</td>
<td>.042</td>
<td>-.006</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Visits to GP</td>
<td></td>
<td></td>
<td>.203*</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>3.</td>
<td>Demands</td>
<td>.053</td>
<td>.005</td>
<td>-.073</td>
<td>ns</td>
</tr>
<tr>
<td>4.</td>
<td>Resources</td>
<td>.076</td>
<td>.076</td>
<td>-.170</td>
<td>ns</td>
</tr>
<tr>
<td>5.</td>
<td>Demands x Resources</td>
<td>.077</td>
<td>.077</td>
<td>-.031</td>
<td>ns</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized \( \beta \) weights for each step of the analysis

* \( p < .05 \)    ** \( p < .01 \)    *** \( p < .001 \)

On the outcome variable of fatigue, the background variables of medical problems and visits to GP accounted for a significant variance (\( \Delta R^2 = 0.051, F \text{ change} = 3.259 \)). Additionally, the independent variables accounted for a significant 16% of the variance in fatigue symptoms (\( R^2 = .161, F = 3.818 \)). A statistically significant main effect of resources on fatigue was observed (\( \beta = -.320, p < .01 \)), suggesting that the resources that are available to the individual enable him to experience less fatigue. However, no interaction effects were found for the outcome variable of fatigue. Figure 1 illustrates the main effect of resources on fatigue. These indicate that under conditions of high resources, fatigue is much lower than under conditions of low resources.

Table 4: Summary of the moderated regression analysis - Fatigue

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
<th>Beta</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
<td>.004</td>
<td>.004</td>
<td>-.062</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td></td>
<td>-.006</td>
<td>ns</td>
</tr>
<tr>
<td>2.</td>
<td>Medical problems</td>
<td>.055</td>
<td>.051*</td>
<td>-.085</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Visits to GP</td>
<td>.180</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>3.</td>
<td>Demands</td>
<td>.083</td>
<td>.028</td>
<td>-.175</td>
<td>ns</td>
</tr>
<tr>
<td>4.</td>
<td>Resources</td>
<td>.161</td>
<td>.079**</td>
<td>-.320**</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>5.</td>
<td>Demands x Resources</td>
<td>.164</td>
<td>.003</td>
<td>-.053</td>
<td>ns</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized \( \beta \) weights for each step of the analysis

* \( p < .05 \)    ** \( p < .01 \)    *** \( p < .001 \)
For the GHQ outcome variable, the background variables of medical problems and visits to GP accounted for a significant 8% of the variance in the above variable ($\Delta R^2 = 0.081$, F change = 5.365). Visits to GP showed a significant effect on the GHQ scores ($\beta = .286$, $p < .01$), suggesting that psychological distress may be predicted by visits to GP. However, the effects of this background variable have been controlled for. In addition, results indicated a main effect of job demands on GHQ scores ($\beta = -.336$, $p < .001$). However, contrary to what was expected, job demands were found to reduce psychological distress. In terms of the buffering hypothesis, a statistically significant interaction effect of demands and resources on GHQ scores was found ($\beta = -.254$, $p < .01$). This finding is congruent with theory as it indicates that the interaction of demands and resources reduces psychological distress. Figure 1 shows the form of the interactions. When employees perceive high levels of control and support, greater demands are associated with a lower level of psychological distress whereas this is much less marked when control and support are lower.

Table 5: Summary of the moderated regression analysis – GHQ

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>Beta</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
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<td>.004</td>
<td>-.049</td>
<td>ns</td>
</tr>
<tr>
<td>2.</td>
<td>Age</td>
<td>.056</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Medical problems</td>
<td>.85*</td>
<td>.081**</td>
<td>.002</td>
<td>ns</td>
</tr>
<tr>
<td>4.</td>
<td>Demands</td>
<td>.187***</td>
<td>.102***</td>
<td>.336***</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>5.</td>
<td>Resources</td>
<td>.210***</td>
<td>.024</td>
<td>-.175</td>
<td>ns</td>
</tr>
<tr>
<td>6.</td>
<td>Demands x Resources</td>
<td>.269***</td>
<td>.059**</td>
<td>-.254**</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized $\beta$ weights for each step of the analysis

* $p < .05$  ** $p < .01$  *** $p < .001$

In the examination of the variable of minor health complaints, the background variables of medical problems and visits to GP accounted for a significant amount of variance in the above variable ($\Delta R^2 = .065$, F change = 4.296), but their effects were controlled for. Additionally, results indicated that demands accounted for a significant 11% of the variance in minor health complaints ($\Delta R^2 = .108$, F change = 16.072). A main effect of demands
items referred to anxiety, fatigue or depression. A nine-point response scale was used, ranging from «I never feel like this» to «I always feel like this». Mean fatigue, anxiety and depression scores were obtained by averaging the four items of each dimension [with reverse scoring for «low» items]. On the basis of reliability check (Cronbach’s α) of the scales, the reversed items of anxiety, depression and fatigue were removed.

**GHQ-12**

The measure of distress was a standardized screening instrument devised for assessing the probability of minor psychiatric disorder through self-report. This was the General Health Questionnaire, a measure which has high validity and reliability in community investigations. The 12-item version of the General Health Questionnaire (GHQ-12, Goldberg & Williams, 1988) was employed, which has been shown to be acceptable and useful in occupational research (Jackson et al., 1993). Reliability coefficients for GHQ have ranged from .78 to .95 (Jackson, 2007). Items were rated on a fully-anchored four-point response scale, ranging from «not at all» [1], to «most of the time» [4]. A total score of general well-being was derived by averaging the 12 items after reversing the appropriate ones. High scores on this scale indicate poor levels of well-being.

**Minor health complaints.**

Thirteen items were derived from the SMU Health Questionnaire (Watson & Pennebaker, 1989) in order to measure minor health complaints (e.g. cold/flu symptoms, aches and pains) with the inclusion of cognitive symptoms. The reliability coefficient for the factor-analytically derived 13-item SMU Health Questionnaire symptom scale was .72. The subjects were asked to indicate whether they had experienced the symptoms over the previous week. A three-point response scale was used, ranging from: not at all [1] to: a lot [3]. All items were summed to give a score of health symptoms.

**Job satisfaction.**

Warr, Cook and Wall’s (1979) job satisfaction scale – an instrument with well-established psychometric properties – was used in the present study. Ten items of the scale were included, five of which measured intrinsic job satisfaction, three measured working conditions extrinsic satisfaction and two items represented employee relations satisfaction. A five-point response scale running from «very dissatisfied» to «very satisfied» was used.
Total scores are the average of the item scores with higher values representing greater satisfaction. The internal reliability (Cronbach's $\alpha$) of the scale is very good ($\alpha = .90$). Internal reliability for intrinsic job satisfaction is $\alpha = .86$ and for extrinsic job satisfaction is $\alpha = .80$ (Warr et al., 1979).

In addition, individuals were asked to indicate their age and marital status (sociodemographic factors). Finally, in order to control for the effects of previous health, the questionnaire included two questions regarding general health status of the workers. In particular they were asked to indicate how often they visited their GP (General Practitioner) over the past year, and whether they had any serious medical health problems over the past two years.

All questionnaires were translated from English to Greek by an independent translator who followed the translation-back translation procedure (van de Vijver and Hambleton, 1996). The Cronbach's alpha reliability coefficients for the Greek data are reported in Table 1.

Results

Table 1 shows the Cronbach's alpha reliability coefficients, mean values, standard deviations and inter-correlations of all the study variables.

**Reliability analysis.**

Most of the scales reached acceptable levels of reliability, with Cronbach's alpha coefficient being above .6. The only exceptions were the anxiety, depression and fatigue scales that have consistently shown low alpha values, even after the removal of the reversed items on the scales. This may be due to the small number of items of the scales. Pallant (2001) noted that when the scale is short, having less than 10 items, it is not uncommon to find quite low Cronbach's alpha values such as .50. In addition, the problem-solving demand scale has shown a low alpha value of .45 that calls for further development of the scale (Jackson et al., 1993). Wall, Jackson & Mullarkey (1995) recommend the five-item version of this scale for future use.

**Correlation analysis.**

Results indicated strong correlations among most of the stressors (demands), the resources (control, support) and the outcome variables (anxiety,
depression, fatigue, job satisfaction, GHQ measures, minor health complaints) as expected.

There are several features of the zero-order correlations which are of interest. Overall, the demands measures, rather surprisingly, showed positive correlations with job satisfaction and negative correlations with some of the strain variables. This finding is incongruent with theory since demands are traditionally perceived to reflect negative aspects of the job such as the complexity of the job. In particular, monitoring demands has shown strong negative correlations with GHQ ($r = -.40, p < .01$), minor health complaints ($r = -.37, p < .01$) and fatigue ($r = -.23, p < .01$) and production responsibility correlated negatively with fatigue ($r = -.22, p < .05$), GHQ ($r = -.30, p < .01$), minor health complaints ($r = -.34, p < .01$) and job satisfaction ($r = .21, p < .05$) indicating beneficial effects of demands and suggesting — in the case of monitoring demands and fatigue — that the active monitoring required on the job increases alertness. Implications of the above unexpected findings will be discussed later.

Both measures of job control showed strong correlations with all of the strain variables apart from anxiety. Specifically, method control correlated negatively with depression ($r = -.21, p < .05$), fatigue ($r = -.32, p < .01$), GHQ ($r = -.28, p < .01$) and minor health complaints ($r = -.36, p < .01$) and positively with job satisfaction ($r = .35, p < .01$). It seems clear that when individuals are given the choice on how to carry out tasks involved in their job, they experience less strain and consequently feel more satisfied. Timing control showed strong negative correlations with fatigue ($r = -.30, p < .01$) and minor health complaints ($r = -.42, p < .01$) and strong positive correlation with job satisfaction ($r = .41, p < .01$), suggesting that when given the opportunity to determine the scheduling of his own work, the individual feels less fatigued, experiences less illness symptoms and is more satisfied.

Finally, support was strongly correlated with most of the outcome variables in the predicted direction. Strong negative correlations of the above variable with fatigue ($r = -.20, p < .05$), GHQ ($r = -.30, p < .01$) and minor health complaints ($r = -.33, p < .01$) and a strong positive correlation with job satisfaction ($r = .39, 0 < .01$) indicated that when individuals have support from their co-workers they experience less strain and psychological distress and feel more satisfied in their job. The above is in line with previous research that suggests that social support is generally associated with well-being.
Table 1: Cronbach’s α, descriptive statistics [Mean, SD], intercorrelations [Pearson’s r] for all the study variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>α</th>
<th>Mean</th>
<th>SD</th>
<th>MDEM</th>
<th>PSDEM</th>
<th>PRRES</th>
<th>TCONT</th>
<th>MCONT</th>
<th>SUP</th>
<th>ANX</th>
<th>DEP</th>
<th>FAT</th>
<th>GHQ</th>
<th>HCOM</th>
<th>JSAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring Demand [MDEM]</td>
<td>.70</td>
<td>4.23</td>
<td>.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem-solving demand [PSDEM]</td>
<td>.45</td>
<td>3.65</td>
<td>.74</td>
<td>.45**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production responsibility [PRRES]</td>
<td>.89</td>
<td>3.75</td>
<td>1.06</td>
<td>.49**</td>
<td>.32**</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timing control [TCONT]</td>
<td>.82</td>
<td>3.32</td>
<td>.99</td>
<td>.16</td>
<td>.20*</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Method control [MCONT]</td>
<td>.83</td>
<td>3.67</td>
<td>.80</td>
<td>.39**</td>
<td>.35**</td>
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<td>.65**</td>
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</tr>
<tr>
<td>Support [SUP]</td>
<td>.78</td>
<td>3.67</td>
<td>.84</td>
<td>.47**</td>
<td>.38**</td>
<td>.42**</td>
<td>.33**</td>
<td>.51**</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Anxiety [ANX]</td>
<td>.50</td>
<td>5.78</td>
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<td>.07</td>
<td>.03</td>
<td>-.03</td>
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<td>-.06</td>
<td>.02</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Depression [DEP]</td>
<td>.53</td>
<td>3.75</td>
<td>2.31</td>
<td>-.16</td>
<td>.14</td>
<td>-.12</td>
<td>-.13</td>
<td>-.21*</td>
<td>-.13</td>
<td>.34**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue [FAT]</td>
<td>.69</td>
<td>3.73</td>
<td>2.37</td>
<td>-.23**</td>
<td>.04</td>
<td>-.22*</td>
<td>-.30**</td>
<td>-.32**</td>
<td>-.20*</td>
<td>.35**</td>
<td>.61**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Health Questionnaire [GHQ]</td>
<td>.62</td>
<td>2.21</td>
<td>.45</td>
<td>-.40**</td>
<td>-.08</td>
<td>-.30**</td>
<td>-.17</td>
<td>-.28**</td>
<td>-.30**</td>
<td>.11</td>
<td>.31**</td>
<td>.33**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor health complaints [HCOM]</td>
<td>.86</td>
<td>.50</td>
<td>.40</td>
<td>-.37**</td>
<td>-.12</td>
<td>-.34**</td>
<td>-.42**</td>
<td>-.36**</td>
<td>-.33**</td>
<td>.25**</td>
<td>.39**</td>
<td>.60**</td>
<td>.37**</td>
<td></td>
<td></td>
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<tr>
<td>Job satisfaction [JSAT]</td>
<td>.86</td>
<td>3.40</td>
<td>.85</td>
<td>.20*</td>
<td>-.01</td>
<td>.21*</td>
<td>.41**</td>
<td>.35**</td>
<td>.39**</td>
<td>-.12</td>
<td>.40**</td>
<td>-.32**</td>
<td>-.35**</td>
<td>-.49**</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01
Hierarchical moderated regression analysis

It has been argued (Aiken & West, 1991) that interactions ideally should be tested with moderated regression analysis. This procedure has been recommended as the most appropriate method for testing main effects and interactions when the independent measures are continuous (Bromet, Dew, Parkinson & Schulberg, 1988; Cohen & Cohen, 1983). Therefore, the data obtained from the present study were analyzed with hierarchical moderated regression analysis.

Monitoring demand, problem solving demand and production responsibility were combined to produce one measure of job demands. Similarly, timing control and method control were combined to produce one measure of job control. Perceived control and social support were combined in the present study in order to represent a higher order moderating factor which has been called resources, as has been done by Hockey et al. (1996) in their study of junior doctors. Similarly, Melamed, Kushnir & Meir (1991) considered control and support as psychosocial resources and examined their joint effects in the context of the demand – control model, in a sample of female social workers.

The two variables were grouped based on theoretical grounds as well. Both control and support are considered to be beneficial to the individual and there is ample evidence indicating their positive effects to well-being. As noted before, after its initial articulation the model was expanded by the inclusion of social support as a third dimension (Johnson & Hall, 1988; Kristensen, 1995), thus adding a social dimension to it.

The regression procedure was carried out in five steps. The first two steps involved controlling for background variables. Thus, in the first step of the analysis, the variables of age and marital status (dummy coded) were entered in order to control for their effects. In the second step, visits to GP and serious medical health problems were entered, in order to control for their effects as well. The remaining three steps, following standard analytical procedure, consisted of entering the demand variable (main effect), the resources (control, support) variable (main effect) and finally the relevant cross-product term (demands x resources: interaction effect). All variables were standardized as a precaution against problems of multicollinearity associated with hierarchical moderated regression (Finney, Mitchell, Cronkite & Moos, 1984).

The forms of the interactions. As the findings established the presence of two interaction effects between demands and resources on indices of strain, the next issue to be addressed was to test whether the interactions...
were of the form predicted. The form of the interaction was plotted following the procedures recommended by Jaccard, Turrisi & Wan (1990).

In terms of the outcome variable of anxiety, results indicated no main effects of demands or resources on this particular measure. However, results indicated an interactive effect of demands and resources on anxiety ($\gamma = -.191$, $p < .01$). In particular, the interaction of demands and resources was found to account for a significant variance in anxiety ($\Delta R^2 = 0.033$, $F$ change = 4.313). The above is consistent with Karasek's model as it indicates that the interaction of demands and resources reduces anxiety. Figure 1 shows the changes in anxiety in relation to demands and resources. Demands are associated with an increase in anxiety under conditions of low resources. On the other hand, when resources are high, an increase in demands is associated with a reduction in anxiety.

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>Beta</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
<td>.029</td>
<td>.029</td>
<td>.150</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td></td>
<td>.04</td>
<td>ns</td>
</tr>
<tr>
<td>2.</td>
<td>Medical problems</td>
<td>.042</td>
<td>.042</td>
<td>-.076</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Visits to GP</td>
<td></td>
<td></td>
<td>.063</td>
<td>ns</td>
</tr>
<tr>
<td>3.</td>
<td>Demands</td>
<td>.045</td>
<td>.003</td>
<td>.055</td>
<td>ns</td>
</tr>
<tr>
<td>4.</td>
<td>Resources</td>
<td>.058</td>
<td>.013</td>
<td>-.129</td>
<td>ns</td>
</tr>
<tr>
<td>5.</td>
<td>Demands x Resources</td>
<td>.091</td>
<td>.033</td>
<td>-.191*</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>

Table 2: Summary of the moderated regression analysis - Anxiety

Note: the Table shows standardized $\beta$ weights for each step of the analysis.

* $p < .05$  ** $p < .01$  *** $p < .001$

In the examination of the depression variable, the background variables account for only 5% of the variance in depression ($R^2 = .048$, $F = 1.528$). A finding worth-mentioning is the significant effect of the background variable of visits to GP on depression ($\gamma = .203$, $p < .05$). This suggests that visits to GP may be a major predictor of depression. However, the effects of this variable have been controlled for. The main effects of demands and resources accounted for only 8% of the variance in depression ($R^2 = .076$, $F = 1.609$) and were not statistically significant. Results indicated no interactive effects of demands and resources on depression.
Table 3: Summary of the moderated regression analysis - Depression

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>Beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
<td>.006</td>
<td>.006</td>
<td>-.027</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td>.082</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>2.</td>
<td>Medical problems</td>
<td>.048</td>
<td>.042</td>
<td>-.006</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Visits to GP</td>
<td></td>
<td>.203* &lt; .05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Demands</td>
<td>.053</td>
<td>.005</td>
<td>-.073</td>
<td>ns</td>
</tr>
<tr>
<td>4.</td>
<td>Resources</td>
<td>.076</td>
<td>.076</td>
<td>-.170</td>
<td>ns</td>
</tr>
<tr>
<td>5.</td>
<td>Demands x Resources</td>
<td>.077</td>
<td>.077</td>
<td>-.031</td>
<td>ns</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized β weights for each step of the analysis
* p < .05       ** p < .01       *** p < .001

On the outcome variable of fatigue, the background variables of medical problems and visits to GP accounted for a significant variance ($\Delta R^2 = 0.051$, $F$ change = 3.259). Additionally, the independent variables accounted for a significant 16% of the variance in fatigue symptoms ($R^2 = 0.161$, $F = 3.818$). A statistically significant main effect of resources on fatigue was observed ($β = -.320$, $p < .01$), suggesting that the resources that are available to the individual enable him to experience less fatigue. However, no interaction effects were found for the outcome variable of fatigue. Figure 1 illustrates the main effect of resources on fatigue. These indicate that under conditions of high resources, fatigue is much lower than under conditions of low resources.

Table 4: Summary of the moderated regression analysis - Fatigue

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>Beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
<td>.004</td>
<td>.004</td>
<td>-.062</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td>.006</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>2.</td>
<td>Medical problems</td>
<td>.055</td>
<td>.051*</td>
<td>-.085</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Visits to GP</td>
<td>.180</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>3.</td>
<td>Demands</td>
<td>.083</td>
<td>.028</td>
<td>-.175</td>
<td>ns</td>
</tr>
<tr>
<td>4.</td>
<td>Resources</td>
<td>.164</td>
<td>.079**</td>
<td>-.320**</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>5.</td>
<td>Demands x Resources</td>
<td>.164</td>
<td>.003</td>
<td>-.053</td>
<td>ns</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized β weights for each step of the analysis
* p < .05       ** p < .01       *** p < .001
For the GHQ outcome variable, the background variables of medical problems and visits to GP accounted for a significant 8% of the variance in the above variable ($\Delta R^2 = 0.081$, $F$ change $= 5.365$). Visits to GP showed a significant effect on the GHQ scores ($\beta = .286$, $p < .01$), suggesting that psychological distress may be predicted by visits to GP. However, the effects of this background variable have been controlled for. In addition, results indicated a main effect of job demands on GHQ scores ($\beta = -.336$, $p < .001$). However, contrary to what was expected, job demands were found to reduce psychological distress. In terms of the buffering hypothesis, a statistically significant interaction effect of demands and resources on GHQ scores was found ($\beta = -.254$, $p < .01$). This finding is congruent with theory as it indicates that the interaction of demands and resources reduces psychological distress. Figure 1 shows the form of the interactions. When employees perceive high levels of control and support, greater demands are associated with a lower level of psychological distress whereas this is much less marked when control and support are lower.

Table 5: Summary of the moderated regression analysis – GHQ

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>Beta</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Marital status</td>
<td>.004</td>
<td>.004</td>
<td>-.049</td>
<td>ns</td>
</tr>
<tr>
<td>2</td>
<td>Age</td>
<td>.056</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Medical problems</td>
<td>.85*</td>
<td>.081**</td>
<td>.002</td>
<td>ns</td>
</tr>
<tr>
<td>2</td>
<td>Visits to GP</td>
<td></td>
<td></td>
<td>.286**</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>3</td>
<td>Demands</td>
<td>.187***</td>
<td>.102***</td>
<td>.336***</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>4</td>
<td>Resources</td>
<td>.210***</td>
<td>.024</td>
<td>-.175</td>
<td>ns</td>
</tr>
<tr>
<td>5</td>
<td>Demands x Resources</td>
<td>.269***</td>
<td>.059**</td>
<td>-.254**</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized $\beta$ weights for each step of the analysis
* $p < .05$ ** $p < .01$ *** $p < .001$

In the examination of the variable of minor health complaints, the background variables of medical problems and visits to GP accounted for a significant amount of variance in the above variable ($\Delta R^2 = .065$, $F$ change $= 4.296$), but their effects were controlled for. Additionally, results indicated that demands accounted for a significant 11% of the variance in minor health complaints ($\Delta R^2 = .108$, $F$ change $= 16.072$). A main effect of demands
on minor health complaints ($\beta = -0.347$, $p < 0.001$) was also observed, however, rather unexpectedly, job demands were found to reduce minor health complaints. Resources accounted for a significant 11% of the variance in minor health complaints ($\Delta R^2 = 0.114$, $F$ change = 19.440). A main effect of resources on minor health complaints was also found ($\beta = -0.385$, $p < 0.001$), indicating beneficial effects of resources. Overall, the two main effects accounted for a significant 30% of the variance in minor health complaints ($R^2 = 0.304$, $F = 8.654$). On the other hand, no interactive effect of demands and resources on minor health complaints was observed. Figure 1 illustrates the main effects of demands and resources on health complaints. High job demands are associated with reduced minor health complaints. In addition, under conditions of low resources minor health complaints are more than when demands are high.

Table 6: Summary of the moderated regression analysis – Minor Health Complaints

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>Beta</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
<td>0.016</td>
<td>0.016</td>
<td>-0.131</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td></td>
<td>0.009</td>
<td>ns</td>
</tr>
<tr>
<td>2.</td>
<td>Medical problems</td>
<td>0.082*</td>
<td>0.065*</td>
<td>-0.074</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Visits to GP</td>
<td></td>
<td></td>
<td>0.278*</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>3.</td>
<td>Demands</td>
<td>0.190***</td>
<td>0.108***</td>
<td>-0.347***</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>4.</td>
<td>Resources</td>
<td>0.304***</td>
<td>0.114***</td>
<td>-0.385***</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>5.</td>
<td>Demands x Resources</td>
<td>0.313***</td>
<td>0.010</td>
<td>-0.103</td>
<td>ns</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized $\beta$ weights for each step of the analysis
* $p < .05$   ** $p < .01$   *** $p < .001$

Finally, the controlled background variable visits to GP had a significant effect on job satisfaction ($\beta = -0.240$, $p < 0.05$), indicating that visits to GP are associated with a reduction in job satisfaction. Resources accounted for a significant 17% of the variance in job satisfaction ($\Delta R^2 = 0.171$, $F$ change = 26.983). In addition, our findings indicated a main effect of resources on job satisfaction ($\beta = 0.472$, $p < 0.001$). Specifically, as expected, resources are a major predictor of job satisfaction and in particular high resources are associated with increased job satisfaction. Overall, the two main effects accounted for a significant 27% of the variance in job satisfaction ($R^2 = 0.270$).
.271, \( F = 7.140 \)). However, results indicated no support for the hypothesized buffering effect of demands and resources on the outcome variable of job satisfaction. Figure 1 illustrates the main effects of demand and resources on job satisfaction. Under conditions of low resources job satisfaction is lower than under conditions of high resources.

Table 7: Summary of the moderated regression analysis – Job satisfaction

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
<th>Beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Marital status</td>
<td>.018</td>
<td>.018</td>
<td>.106</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td>-.126</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Medical problems</td>
<td>.74*</td>
<td>.056*</td>
<td>-.007</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Visits to GP</td>
<td></td>
<td>.240*</td>
<td>&lt;.01</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Demands</td>
<td>.100*</td>
<td>.027*</td>
<td>.172</td>
<td>ns</td>
</tr>
<tr>
<td>4.</td>
<td>Resources</td>
<td>.271***</td>
<td>.171***</td>
<td>.472***</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>5.</td>
<td>Demands x Resources</td>
<td>.278***</td>
<td>.007</td>
<td>.086</td>
<td>ns</td>
</tr>
</tbody>
</table>

Note: the Table shows standardized \( \beta \) weights for each step of the analysis

* \( p < .05 \)

** \( p < .01 \)

*** \( p < .001 \)
Discussion

The primary aim of the present study was to retest the demand–control model hypotheses with some improvements over prior methodologies. The results of the study provided strong support for the additive hypothesis of the model, indicating main effects of job demands and job resources on several of the outcome measures. In terms of the buffering hypothesis, the findings partially supported the interactive effects of job demands and resources, since two out of the six hypothesized interactions reached statistical significance. Implications of the above findings will be discussed below.

Jaccard et al. (1990) point out that main effects are usually a meaningful piece of information. Our results indicated a main effect of job demands on minor health complaints and GHQ scores but in the opposite than the expected direction, as they were found to reduce health complaints and psychological distress. This finding is incongruent with theory as a large body of research suggests that prolonged exposure to high job demands is significantly associated with somatic symptoms, hypertension, gastric complaints, headaches and mental ill-health (Warr, 1987). In a meta-analysis by Stansfeld and Candy (2006), high job demands were found to be associated with an increase in psychological distress (Dalgard et al, 2009). We can only speculate as to the reasons for this surprising finding.

Vegchel, de Jonge & Landsbergis (2005) argue that job demands can sometimes be positive. Indeed, Warr (1987) argued that only when job demands are very high or very low they will have a negative effect on well-being. If tasks provide the worker with an adequate amount of job demands, they
will be perceived as challenging rather than stressful (Frankenhaeuser & Gardell, 1976; Frankenhaeuser & Johansson, 1986) and thus will have beneficial effects on well-being.

An alternative explanation for the above finding has been put forward by Fox et al., (1993) who argued that two individuals facing identical objective demands may appraise them differently. It is clear that individual differences variables such as ability and prior experience with the demanding situation can account for these perceptions. As Jex & Beehr (1991) pointed out, researchers should explore the process by which individuals translate their work environments into cognitive appraisals of demands. As Ganster (1989) reported, experiments in participative goal setting suggest that individuals, when given the option, might impose higher demands on themselves than would have been imposed to them. Thus, in several circumstances, job demands may be perceived as less threatening.

Additionally, results indicated main effect of resources on three of the outcome variables – fatigue, minor health complaints and job satisfaction – in line with previous research that has provided strong support for additive effects of control and support on psychological and job-related well-being. A large body of research has shown beneficial effects of both types of resources on well-being. Specifically, a high level of job control is associated with job satisfaction (Dwyer & Ganster, 1991; Mansell & Brough, 2005), psychological well-being (Perrewe & Ganster, 1989; Spector, 1987), and a lowered prevalence of common mental disorders (Dalgard et al., 2009; Bultmann, Aust, & Burr, 2006; Sanne, Mykletun, Dahl, Moen, & Tell, 2005; Warr, 1990). Furthermore, research has indicated that low job control is associated with fatigue (Andrea, Kant, Beurskens, Metsemakers & van Schayck, 2003) and general musculoskeletal complaints (Hollmann, et al., 2001; Vanroelen et al., 2008). Similarly, many studies have linked social support with high levels of job satisfaction (Dollard & Winefield, 1998; Sann, 2003) and low social support is consistently associated with higher fatigue-related outcomes (Bültmann, Kant, van den Brandt & Kasl, 2002a; Bültmann, Kant, Schroer & Kasl, 2002b; Godin, Fontaine & Kittel, 2004) and musculoskeletal complaints (Cole, Ibrahim, Shannon, Scott & Eyles, 2001). It is clear that the results are supportive of the expansion of the demand – control model to include social support.

Overall, the findings of an additive demand–control model are consistent with other research in relatively homogeneous samples (Perrewe & Anthony, 1990; van der Doef & Maes, 2002; de Croon, Blonk, de Zwart, Frings-Dresen
A final point regarding main effects and their interpretation should be made. Finney, Mitchell, Cronkite & Moos (1984) noted that a significant main effect in the presence of an interaction term is interpreted as the effect of that variable at average levels of the moderator variables. Thus, a consistent main effect of demands would indicate a significant effect of demands upon strain at average levels of control or social support.

In terms of the buffering hypothesis, our results provided partial support of the interactive demand–control model. In particular, the moderated regression analyses indicated that two out of the six interactions that were tested were statistically significant and both were in the hypothesized direction. Specifically, our results have showed that when control and support are low, high demands are associated with an increase in anxiety. Moreover, under conditions of high control and support, anxiety decreases as demands become greater. The second main finding indicated that greater demands are associated with a lower level of psychological distress when employees perceive high levels of resources available to them. However, rather unexpectedly, even under conditions of low control and support, greater demands were associated with low psychological distress, although in the latter case this is much less marked. Further implications of the above will be discussed later.

The first finding of an interaction term highlights the detrimental effects of low job control and support on strain. Landsbergis (1988) further highlights the above by pointing out that control levels that are too low can have negative socialization effects in the long run. Low control environments may act to reduce one’s coping abilities and motivation to improve the job situation. To the best of our knowledge, interactive effects of demands and resources on anxiety have never been found (Häusser et al., 2010). Several studies have shown additive effects for that particular outcome variable (Sann et al., 2005; O’Connor, O’Connor, White & Bundred, 2000) but buffering effects were not reported.

The second significant interaction found indicates that control and support have beneficial effects on well-being, as they lower psychological distress, even under conditions of high demands. This is consistent with other findings showing that, when job control and social support are high, even when jobs impose high demands [“active jobs”] on the individuals, psychological distress does not increase (Bourbonnais, Comeau & Vézina, 1999; Macklin, Smith & Dollard, 2006). However, the observed form of
the interaction deserves a comment. Contrary to expectations, high job demands were associated with low psychological distress, even under conditions of low control and support. This suggests that demands may be perceived as enabling and indicates that the common assumption that high demands always impair well-being is sometimes unsatisfactory.

A final comment on a significant finding should be made. The finding that resources in the form of control and support, accounted for a significant variance in fatigue, minor health complaints and job satisfaction, reinforces the view that control and support factors are important determinants of how people respond to stressors and that predictive models of occupational stress need to include variables that are more encompassing than simply job demands and control.

**Implications for the demand – control model**

Our results provided partial support for the buffering hypothesis, as interactions were found for some of the strain variables but not for others. As Warr (1990) pointed out, there is no reason to expect that all types of outcome variables will be affected in a similar way by the key variables of the demand–control model. Indeed, as Schreurs & Taris (1998) have noted, the validity of the model has mainly been examined in the area of cardiovascular disease with supportive findings and in the domain of stress and well-being with rather inconsistent findings. Other types of outcome variables have been less frequently employed. The present study examined the effects of perceived control, social support and job demands on variables other than well-being and cardiovascular disease only. It examined the effects of the key variables on work-related outcomes (e.g. job satisfaction) and health-related outcomes as well (e.g. minor health complaints, fatigue), thus suggesting that the interaction of demands and resources can have an impact on a wider range of outcome variables. In a recent review of the model (Häusser et al., 2010) the authors reviewed studies that used different outcomes in order to test the strain and buffering hypothesis, and, in general, studies that examined job-related well being found less support for the interaction compared to studies that examined the above-mentioned outcome measures.

Previous research provided support for buffering hypothesis of the demand–control model using multi-occupational groups (de Jonge & Kompier, 1997). Studies using homogeneous samples usually reported primarily main effects. Our research used a relatively homogeneous sample and found partial support for the interactive hypothesis, thus calling for additional research.
on Karasek's model in homogeneous samples. De Jonge & Kompier (1997) conclude that in order to find support for buffering effects, samples should be homogeneous in disturbing variables such as socio-economic status but heterogeneous in terms of exposure.

The use of self-report measures in stress research has been largely criticized and remains an issue of ongoing debate (Schmitt, 1994; Spector, 1994). This study's findings would suggest that self-report measures are both useful and necessary. The results suggest that perceptions of objective situations may be far more predictive of stress outcomes than the objective situation.

On the basis of empirical research, Johnson and his colleagues (Johnson & Hall, 1988, 1994; Johnson, Hall, & Theorell, 1989) expanded the demand-control model to a three-dimensional demand-control-support model. The findings of the present study justify the inclusion of the social support construct in the model. It has been argued (House, 1981) that for several significant workplace stressors such as noise, work overload, time pressure and dangerous working conditions, support from coworkers is of primal importance.

Finally, the results that indicated partial support for buffering effects of control and support have important implications. In terms of the social support dimension, programs that foster support in the workplace should be developed, as this would prevent the adverse psychological and health effects of job stress but without necessarily resulting in reduced productivity. Furthermore, in terms of the buffering effect of job control that was found, the important practical implication is that interventions can be directed towards increasing employee control without reducing job demands. The above will have a positive impact on the quality of the work environment and at the same time will not reduce productivity. As Ganster (1989) pointed out, the model implies that reduction of employees' strain and increase in productivity are not incompatible goals.

**Limitations of the study**

The present study, as all cross-sectional research, does not provide a firm basis for drawing causal inferences (de Lange et al., 2003). Indeed, the causal direction between job characteristics and well-being cannot be proved, as reversed or reciprocal causal relationships might operate. However, it should be noted that in a thorough examination of causality between the characteristics of the job and well-being, de Jonge, Dormann, Janssen, Dollard, Landeweerd & Nijhuis (2001) found regular rather than reversed or reciprocal...
causations (van Vegchel et al., 2005). In addition, Sargent & Terry (1998) argued that cross-sectional designs may inflate the observed correlations between predictors and outcome variables due to response consistency effects. These effects are related to stable dispositional factors such as negative affectivity and unstable occasional factors such as mood (Spector & Brannick, 1995; Zapf, Frese & Dormann, 1996). Zapf et al. (1996) suggest the inclusion of a meaningful longitudinal component in future studies in order to control for the potential biasing effects of the above factors.

Several problems associated with the use of self-report questionnaires should be addressed and taken into account. De Jonge et al. (1999) report the possibility of a conceptual overlap between the dependent and the independent variables as they both reflect the construct of stress. Furthermore, self-reports are linked to common method variance problems due to the fact that the information is derived from the same source. In addition, the presence of a third variable such as a personal trait may lead to a spurious relationship between the variables. Finally, it has been suggested that the presence of an outcome variable might influence or alter the perception of job characteristics and thus the causal direction of the relationship between affective variables and perceptions of the environment may be reversible (Staw, 1980). This suggests that if an individual is depressed, he might perceive his work as stressful. Indeed, James & Tetrick (1986) have found that the way individuals perceived their environment caused affect which in turn influenced their perceptions. Nevertheless, Lazarus’ (1966) work on the cognitive appraisal of stress indicates that the perception of a stimulus as a stressor depends largely on the way the individual perceives it; therefore, a direct question to individuals about their level of work stress seems both logical and necessary (Shultz, Wang, Crimmins & Fisher, 2010).

It should be noted, however, that although the study used self-reported measures which are subjectively reported, it was assumed that a degree of objectivity would be obtained as they consisted of purely descriptive items and did not incorporate affective biases. In support of the above, the findings of interaction effects is evidence of no impact of such bias, otherwise the main effects would be inflated at a cost to the detection of interaction effects (Wall et al., 1996).

In the present study we did not control for negative affectivity, a trait that has been considered to be a biasing factor that may spurious inflate correlations between self-report of stressors and strains (Moyle, 1995; Vegchel, de Jonge & Landsbergis, 2005). Although such a possibility cannot be ruled
out, Karasek et al. (1998) that controlling for negative affectivity may lead to Type II errors, removing the true variance in strain measures. Indeed, a meta-analysis by Spector, Zapf, Chen & Frese (2000) has indicated that partialling out negative affectivity would be a wrong approach as it would be like «throwing out the baby with the bath water» (p.91) and recommended a better quality of data.

The fact that the study was conducted in a homogeneous sample of miners resulted in limited variance in job demands which might have reduced the observed effect sizes due to a restriction of range in the variables under consideration. On the other hand, self-report of job demands and resources were not confounded by other differences in job characteristics of selection effects (Kasl, 1989). In conclusion, generalization of these findings to other occupations and settings awaits further empirical investigation.

Finally, the small sample size of the present study does not provide enough statistical power. A larger sample size would allow more concrete conclusions to be made.

Suggestions for future research

In the light of the previous discussion, several recommendations become apparent. The use of a longitudinal design is recommended, in order to reduce the problem of reversed and reciprocal causality (Frese & Zapf, 1988; de Lange et al., 2003). Moreover, Ganster (1989) suggests that longitudinal designs have the additional benefit of assessing the effects of losses of job control in addition to gains in job control. This is important as there is evidence suggesting that having control at work and losing it may have much more serious health consequences than never having control.

Individual factors such as certain personality characteristics, for example locus of control (Parkes, 1991), coping behavior (Eriksen & Ursin, 1999), self-efficacy (Schaubroeck & Merritt, 1997) and Type A/B behavior (Jamal, 1999a) may influence the appraisal of the environment, directly affect levels of strain or may moderate the relationship between stressors and strain. Future research may consider exploring the role of these factors in the experience of work stress.

Several researchers have emphasized the importance of the study of coping as an individual style of adaptation to the work environment, in order to account for the limited support for the buffering hypothesis of the model (Shimazu, de Jonge & Irimajiri, 2008; Daniels, 1999). Coping may be problem-
focused, involving taking direct action towards resolving a problematic situation and minimizing its stressfulness, or emotion-focused, involving efforts to regulate emotions experienced because of the stressful event. Although problem-focused coping has been linked to better health (Brown, Westbrook & Challagalla, 2005), prolonged use of such an effortful coping mode may result in cognitive fatigue and have negative effects on the individual’s health in the long run (Hockey, 1997). Future research on the demand-control model should include coping behavior in to further explore its role in the stress-strain relationship.

Despite the problems associated with self-reports research has shown that self-report measures provide a fairly accurate account of objective job characteristics (Griffin, 1983). Indeed, Elsass & Veiga (1997) suggested that perceptions of objective situations may be far more predictive of stress outcome than the objective situation. In conclusion, future research should include both self-reports, objective indexes of job stressors taken from supervisors, peers and job analysts and biological measures of stress such as cortisol levels.

Group assessments of job characteristics have been useful in predicting employee health (Spector, 1992; Frese & Zapf, 1988). Spector (1992) conducted a meta-analysis of 16 convergence studies and found that aggregated-level correlations between job characteristics and outcomes were similar to individual-level correlations and the convergent validity at the aggregated level was larger than at the individual level. It is therefore recommended that subsequent research uses both group and individual assessments of job characteristics (de Jonge, van Breukelen, Landeweerd & Nijhuis, 1999).

The majority of studies examining the demand-control model aimed at studying differences between individuals in the way they perceive their job (Morrison, Payne & Wall, 2003). However, it is clear that there are temporal variations in job demands and job control, hence studies that examine within-individual changes in job characteristics by the use of diaries would be both useful and necessary (Totterdell, Wood & Wall, 2006).

A recent idea that has been put forward by Häusser and his colleagues (2010) in order to account for the limited support for the buffering hypothesis has to do with the way job demands and job control are operationalized. In particular, they argued that job demands and job control should match, indicating that they should be based on a qualitatively identical dimension.
For example, job demands operationalized as time pressure should be matched to job control operationalized as timing control. Using exploratory data analyses in order to test the above idea, they were able to provide support for their argument that when job demands and job resources match, the likelihood of finding interactive effects increases. De Jonge & Dormann (2006) extended the idea of the matching principle to the so-called triple matching principle. According to this principle, buffering effects are more likely when demands, control and strain match. Further research on the demand–control model should be directed towards the matching principle.

In conclusion, a work environment without stress and strain is an impossible goal (Pines, 1982). However, much can be done in order to reduce the risk of stress and strain by increasing both job control and social support.

REFERENCES

8. Brough, P. & Williams, J. (2007), «Managing Occupational Stress in a High-
Effects of Job Demands, Control and Support on Psychological ...


group and individual level assessments of job characteristics in testing the job demand-control model: A multilevel approach», Human Relations, 52(1): 95-121.


78. Sann, U. (2003), «Job Conditions and Wellness of German Secondary School


106. Warr, P., Cook, J. & Wall, T. (1979), «Scales for the measurement of some work


EFFECTS OF JOB DEMANDS, CONTROL AND SUPPORT ON PSYCHOLOGICAL AND WORK-RELATED WELL-BEING IN A SAMPLE OF GREEK BLUE-COLLAR WORKERS

Summary

The present study re-examined Karasek's (1979) demand-control model in a relatively homogeneous sample of blue-collar workers in Greece, using a descriptive measure of job demands and a more focused measure of job control, as recommended by Wall, Jackson, Mullarkey & Parker (1996). Both the strain hypothesis and the buffering hypothesis were investigated. Measurements were in the form of a questionnaire which comprised various scales in order to measure stressors (cognitive demands), resources (control, social and technical support) and psychological and work-related well-being (anxiety, depression, fatigue, GHQ, minor health complaints, job satisfaction). Data were analyzed mainly with hierarchical moderated regression analysis. The findings provided strong support for the strain hypothesis, as job control and support were found to have a direct effect on various outcome variables (fatigue, minor health complaints, job satisfaction). In addition, results indicated partial support for the interactive hypothesis, suggesting that perceived control and social support synergistically buffer the effects of stressors upon strain, in the form of anxiety and psychological distress.

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