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A longitudinal diary-based study of the demand – control model and effort in a sample of Greek nursing staff

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By

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Στον λατρεμένο μου Νίκο

Σε ευχαριστώ για την αγάπη σου,
την χαρά, την ευτυχία

ABSTRACT

The present study employed a diary-based longitudinal framework in order to examine the demand – control model in a homogeneous group of Greek nursing staff. The purpose of the present study is twofold. First, it aimed at examining the demand – control model (Karasek, 1979; Karasek & Theorell, 1990) comprehensively, with the use of different data analytic procedures. Second, it investigated the main and interactive effects of effort, which has been considered to play an important role in the active management of job demands.

A pilot study was initially undertaken in order to check the reliability of the diary booklet and the perceived relevancy of the items. Exploratory factor analysis confirmed the dimensionality of the job characteristics, mood and effort items, since they tapped the a priori dimensions. Hierarchical multiple regression analysis provided partial support for the interactive hypothesis and substantial support for the additive model. Enhancing effects of control and support were also observed. The examination of effort indicated that individuals adopted an active, direct coping mode of demand management.

Between-individuals cross-sectional analyses failed to provide support for the model. Hierarchical multiple regression analyses of the questionnaire data indicated main effects of resources. Analyses of the aggregated diary data supported the additive model and revealed enhancing effects of job control and social support. The results suggested the possibility of aggregation biases. The examination of the effort variable showed that individuals were operating in a direct coping mode of demand management.

Standardised pooled within-individual analyses provided partial support for the demand – control model. The results revealed main effects of demands, control and support for the outcome variables, indicating detrimental effects of demands and beneficial effects of control and support. Negative effects of effort were also found, suggesting that individuals were employing the strain mode of demand management.

The longitudinal analysis of the demand – control model failed to indicate any prospective association between the variables under consideration. Possible reasons for the lack of longitudinal effects are considered. Analyses of effort suggested the adoption of a direct, active coping mode of demand management.

Methodological contributions and limitations of the present study are discussed, implications of the findings are considered and suggestions for future research are made.

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CHAPTER 1

OCCUPATIONAL STRESS AND THE DEMAND – CONTROL MODEL

1.1 Introduction

One of the most popular models in the domain of job stress and employee health is the *demand – control model* (Dollard & Winefield, 1998; Beehr, Glaser, Canali & Wallwey, 2001). Since its original articulation (Karasek, 1979) the model has gained paradigmatic influence in the field of work and health. The demand – control model is distinguished from other models of job stress by its simplicity. Importantly, the model highlights the interaction between the individual and his or her own work environment, emphasising that job redesign should be the target for improving employee's health (de Jonge, Reuvers, Houtman & Kompier, 2000). The model is of both theoretical and practical importance, and therefore is an excellent example of a "middle ground" model (Karasek & Theorell, 1990).

More fundamentally, the model proposes that the strongest aversive job-related strain reactions such as depression and health complaints would occur when jobs are simultaneously high in job demands and low in decision latitude. This interactive hypothesis is further theoretically supported by the accumulating evidence on detrimental effects of job demands on health and well-being and the even stronger evidence on beneficial effects of job decision latitude (Fletcher & Jones, 1993; Landsbergis, 1988; Parkes, Mendham & Rabenau, 1994). Additionally, the interactive hypothesis is consistent with research that postulates that job control extenuates the effects of stressors (Frese, 1989; Mineka & Kelly, 1989). However, the critical issue surrounding the interactive hypothesis is the proposal that job demands and job control

interact to predict ill-health effects in such a way that the impact of job demands on health outcomes becomes less potent at higher levels of control. The practical implication of such a proposal is obvious: demands can increase posing little or no threat to psychological strain provided that decision latitude is also enhanced (Wall, Jackson, Mullarkey & Parker, 1996).

Although the interaction effect is the fundamental part of the theory, empirical evidence supporting this mechanism has been characterised as limited and unclear (Kasl, 1996). Kasl (1996) maintains that the credibility of the model would be enhanced by more research findings reporting interactions. Recently, Wall *et al.* (1996) raised two points in an attempt to account for the mixed and inconsistent findings: they hypothesised that the reason for no detection of interactive effect might be the incorporation of affective judgments in the measurement of job demands. In particular, due to the presence of an affective element in the independent variable and indeed in the dependent variable, a spurious main effect is built into the observed relationship, which may result in failure to detect interaction effects. They therefore recommend the use of purely descriptive measures of job demands, in order to reduce the possibility of common method variance.

In addition, they pointed out that the original measure of decision latitude is much broader than job control as it comprises control, skill variety and job complexity. However, the above concepts should not be equated. Wall, Jackson & Mullarkey (1995) found that whereas skilled jobs could be distinguished from less skilled ones, they were not different regarding job control. They therefore recommend the use of a more focused measure of job control.

A further issue that has been raised by a number of researchers is the necessity of repeated measurements methodologies such as longitudinal and diary-based methodologies, in order to capture the dynamic relationships between stress and health

variables (Hockey, 1997; Tattersall, 2000). The majority of the studies that tested the demand – control are of a cross-sectional nature therefore the issue of causality cannot be systematically addressed and the dynamics of the relevant variables cannot be examined. A call for a longitudinal examination of the demand – control model has been made by several investigators (Carayon, 1993; Zapf, Dormann & Frese, 1996; Smulders & Nijhuis, 1999).

The present study addresses several of the above-mentioned criticisms. As recommended by Wall *et al.* (1996), purely descriptive measures of job demands and a more precise measure of job control are used to test the demand – control model. Social support measures are also used and the joint moderating effects of job control and social support (resources) are tested (Astrand, Hanson & Isacsson, 1989; Hockey, Payne & Rick, 1996; Johnson, 1989; Melamed, Kushnir & Meir, 1991). In addition, the present study examines the demand – control model in nursing staff, a relatively homogeneous group that is characterised by a high level of naturally occurring variation in demands and control (Ganster, Fox & Dwyer, 2001). The choice of a single occupation contributes to the elimination of the confounding of socio-economic factors with job demands that has obscured results from the large multi-occupational studies.

It has been proposed that interaction will be found in well-described homogeneous groups with sufficient variability on job characteristics (de Jonge *et al.*, 2000; Hockey, 2000; Kristensen, 1995, 1996). Moreover, this study proposes to focus on specific job demands in the current study group (nursing staff) and to incorporate these demands in the model. For example, emotional demands, particularly due to the direct demands of clients and patients, are becoming increasingly important with the ever-expanding service sector (Söderfeldt, Söderfeldt, Muntaner, O'Campo, Warg & Ohlson, 1996). Further, exposure to physical hazards is still very prevalent (Houtman *et al.*,

1999; Paoli, 1997). The measures of physical and emotional demands, both of which are linked to the nursing profession, were therefore included in the current study.

The present study extends prior research in a number of respects. First, it incorporates a measure of effort in order to explore its role to the active management of job demands. Second, it examines the demand – control model rigorously, using a range of analytic procedures. The study pioneers in the consideration of the demand – control model in a longitudinal diary-based framework. The diary methodology is fully exploited in order to conduct dynamic within-individual analyses, thus examining the model rigorously and gaining some perspective in the microprocesses underlying its basic variables. Additionally, conventional cross-sectional between-individuals analyses and aggregated analyses are performed on the data obtained. The study includes 2 waves of measurement in order to examine the demand – control model longitudinally. Diaries and one-off questionnaires are used in both waves, incorporating a wide range of well-validated scales. A pilot study is additionally undertaken, in order to explore the variables subsequently used in the main study and to get an indication of the individuals' responses and reactions to a diary-based study.

1.2 Scope of the Thesis

Chapter 1 provides the theoretical background to the present research, specifically focusing on the issue of occupational stress, discussing alternative theories of occupational stress and providing a detailed analysis of the demand – control model. It further addresses methodological considerations on the model and presents an overview of the studies that tested it cross-sectionally. The current research was conducted in a nursing sample in Greece; therefore, issues pertaining to the nursing profession in Greece are also discussed in chapter 1. A detailed literature review, entailing the theoretical background and development of the constructs used to test the

demand – control model, and these adopted in the current study can be found in chapter 2.

Chapter 3 discusses the methodology of the longitudinal and diary approaches which are the basis of the study. This includes an assessment of the methodological criteria associated with the use of longitudinal studies and the structured diary methodology. A detailed description and review of the relevant literature can be found in chapter 3. The analytic procedures employed in the present study, in particular the ones pertaining to the diary data, are described in chapter 3. The general methodology of the current study, issues relating to the sample, the procedure and the scales used are discussed in chapter 4. A pilot study was initially conducted in order to test the measures that were subsequently used in the main study and this is described in detail in chapter 5.

Chapters 6 and 7 present the analysis of the cross-sectional data, with the use of three different analytic procedures. Discussions of the findings obtained are additionally provided. Chapter 8 provides a description and discussion of the longitudinal data analysis, using the above-mentioned analytic approaches. The main findings are discussed and the implications, limitations and methodological artifacts are considered. Finally, chapter 9 provides a general discussion of the methodological issues surrounding the study, indicates the implications of the present research, addresses possible limitations and gives directions for future research.

1.3 Occupational Stress

During the past few decades, in western society there has been a shift in emphasis on a particular type of health threat in the work environment: *occupational stress* (Kahn & Byosiere, 1992). In recent years occupational stress has increased due to the increasing job demands in terms of long-term time pressure. In addition, this

increase was linked to the rapid changes in the nature of jobs, mainly because of the introduction of new technologies and international competition (Houtman & Kompier, 1995; Johnson & Hall, 1994; Levi, 1994; Offermann & Gowing, 1990). A recent European survey on working conditions among 13000 employees revealed that 20% experienced permanent high time pressure, 35 to 40% reported a lack of job control, and almost 25% are involved in repetitive tasks of short duration (Paoli, 1992). Further evidence comes from a recent Labour Force Survey in United Kingdom (Hodgson, Jones, Elliott & Osman, 1993) indicating that the three most common problems mentioned were musculoskeletal problems, job stress and depression (Buunk, de Jonge, Ybema, & de Wolff, 1998).

Several researchers have observed the disagreement on the exact definition of stress (Kahn & Byosiere, 1992) and the lack of a general theory of stress (Schabracq, Cooper & Winnubst, 1996). More than forty definitions of the concept of stress in the literature have been traced by Van Dijkhuizen (1980). One of the main reasons for this disagreement is the fact that stress is a multidisciplinary field. Most researchers, however, do agree that there have been 3 different approaches to the study of stress (Buunk *et al.*, 1998; Crandall & Perrewe, 1995; Kahn & Byosiere, 1992; Lazarus, 1993; Semmer, 1996): the stimulus-based or *engineering* approach; the response-based or *medico-physiological* approach; and a more psychological approach illustrated by *interactional* and *appraisal* theories of stress.

According to the engineering approach, stress is a stimulus characteristic of the person's environment, an external load or demand placed on the individual or some aversive or noxious element of that environment (Chmiel, 2000). In contrast, the medico-physiological approach regards stress as a "generalised and non-specific" response to aversive or noxious environmental stimuli. This notion of stress stems from Selye's (1978) theory. According to Selye, stress is a non-specific reaction of the

organism to an external threat and may be caused by a variety of factors. The organism's effort to defend itself from the threat triggers a complex of physiological reactions called by Selye "the General Adaptation Syndrome" (GAS). Although this approach has given more insight into physiological processes, it has contributed little to our knowledge about what makes a particular stimulus stressful (de Wolff *et al.*, 1998).

The above approaches have been judged as inadequate in terms of their inability to account for the available data and the lack of theoretical sophistication. They view the person as essentially passive in the operation of stress. Furthermore, since intervening (psychological) processes are excluded, dealing with individual differences becomes difficult (Cox, 1995). Finally, the approaches fail to take explicit account of the person in relation to his environment.

On the other hand, the interactional approach expresses the view that stress arises through the existence of a particular relationship between an individual and his environment. Therefore stress is regarded as a process operating in time and not as fixed component of either the environment or the response of the individual (McKay & Cooper, 1987). This approach was stimulated by Lazarus (1966), who argued that the stressfulness of an event depends on whether the individual perceives it as such. Consequently, he stressed the transactional nature of stress, viewing stress as the entire phenomenon of stimuli, response and intervening variables (Chmiel, 2000). The core element of the *transactional* model is appraisal, which may occur repeatedly following the introduction of a stressor. The transactional models are important because they invoke a full panoply of human cognitive activities (Appley & Trumbull, 1986). *Transactional* models emphasise the psychological nature of stress. Stress is treated as a psychological state that is the internal representation of a particular and problematic transaction between the individual and his environment. This psychological state, however, is a "snap shot" of a wider and dynamic stress process involving an ongoing

sequence of person environment transactions (Cox & Ferguson, 1991; Lazarus & Folkman, 1984). An important advantage of the mediational perspective is that it highlights the cognitive, evaluative and motivational processes that mediate the effects of stressors on well-being. Consequently, rather than solely focusing on the nature of stress or stress reactions, more refined theoretical views on the stress process can be developed. According to Lazarus and his colleagues (Lazarus, 1966; Folkman & Lazarus, 1986), the outcome of a stressful transaction is mediated by appraisal and coping. Individual differences are obvious in relation to both appraisal and coping.

1.3.1 The Stress continuum

A distinction should be made between *stress, stressor* and *strain,* the three most commonly used terms in the literature. The term stressor refers to the objective characteristics of the environment that impinge on the perceptual and cognitive processes of individuals (Eden, 1982). Stress is defined as "those properties of the environment as they are experienced by the person and are represented in his consciousness"(Eden, 1982: 313). Finally, strain is defined as the individual's maladaptive psychological or physiological response to stress. Since both stress and strain are dependent on prior stressors, a clear conceptualisation of stressors is needed for a better understanding of stress and strain (Pratt & Barling, 1988). A distinction between different types of stressors is therefore important, as they may result in different outcomes (Keenan & Newton, 1985), involve different coping strategies (Payne, Jick & Burke, 1982), require different methodologies for their investigation (Eden, 1982; Werbel, 1983) and may require different time lags in the stress-outcome relationship.

Wheaton (1996) distinguished primarily between *event stressors* and *chronic stressors*. These represent end-points on a continuum that indicates how discretely or

continuously stressors operate. The defining issue of an event stressor is its discreteness, both in typical time course and in its onset and offset (Chmiel, 2000). An event stressor, almost by definition, will end, while chronic stressors typically have a longer time course, from onset to resolution. Chronic stressors do not necessarily start as an event, but develop slowly and insidiously as a continuing problematic condition in our social environments and roles. Their ofset is problematic and often unpredictable (Wheaton, 1996). Thus, chronic stressors are typically open-ended, using up the individual's resources in coping but not promising resolution (Chmiel, 2000). The distinguishing feature between event stressors and more continuous stressors is the time course of a stressor, but there is more involved, including differences in the ways in which the stressor develops, exists, and ends.

A concept often mistaken for chronic stress is *daily hassles* (Kanner, Coyne, Schaefer & Lazarus, 1981). The emphasis in the stress literature is on events and crises as the sole basis for defining stress. The alternative focus here is on "relatively minor stresses....that characterise everyday life" (Kanner *et al.*, 1981:2). A distinction between macro and micro level stressors is therefore introduced, crosscutting the distinction between discrete and continuous stressors. Hassles are defined as "the irritating, frustrating, distressing demands that to some degree characterise everyday transactions with the environment" (Kanner *et al.*, 1981:3). Daily hassles refer to stressors that occur at the experienced juncture of daily life and micro social routines. Loo (1986) suggested that in the long term daily hassles may have a greater impact on the individual's psychological well-being than events.

Researchers investigating the effects of stressors on mood sometimes discover stressor-specific effects. For example, *severe daily events* (Stone & Neale, 1984) and daily hassles (Eckenrode, 1984) affect same-day mood (Stone & Neale, 1984), but *acute stressors* do not. When psychological symptomatology is the criterion, differential

effects dependent on the type of stressor emerge. Kanner *et al.* (1981) concluded that aggregated daily hassles were a significant predictor of psychological symptom level, but acute stressors were not. As studies indicate that acute stressors have fewer long-term consequences than chronic stressors (Loo, 1986), the nature of the stressor needs to be precisely specified.

Furthermore, the type of stressor present may determine the timing of consequences of stressors. Evidence suggests that *minor life events* and daily hassles have immediate, same-day effects on mood, but do not affect mood of the following day (Eckenrode, 1984; Stone & Neale, 1984). Chronic stressors may have more long-term effects, whereas the effects of acute stressors last as long as the stressors themselves last. Thus, knowledge of the type of stressor allows one to predict more precisely the nature of the outcome and its duration. From this, better prevention and intervention strategies could be designed.

Finally, coping techniques may also be dependent on the type of stressor involved. Eckenrode (1984) suggests that acute stressors tend to result in a more specific set of time limited coping responses than chronic stressors. The availability and accessibility of social support may require time. Therefore, social support may be more beneficial in coping with chronic stressors that, as previously mentioned, occur repeatedly.

1.3.2 Occupational stress as an Emotional process

Although a very large variety of stress reactions can be distinguished, several authors assert that negative emotions constitute a major feature of stress (Gaillard & Wientjes, 1994). Emotions are the end-results of how people appraise the person-environment relationship, and are therefore considered to have "diagnostic value" (Folkman & Lazarus, 1985). Pekrun & Frese (1992) suggested that job stressors may

generate a variety of negative emotions, including *anger* and *disappointment,* and argued for the use of such emotions as the crucial dependent variables in the stress process. Furthermore, Warr (1987) conceptualised mental health at work primarily in terms of various affective states, i.e. *anxiety, depression* and *discontent.*

There are many different kinds of negative emotions that may be experienced in the context of occupational stress (Lazarus, 1993). Anxiety is considered to be the most typical emotion associated with stress (Hamberger & Lohr, 1984). There is evidence to suggest, however, the frequent occurrence of other emotions in the face of occupational stress (Warr, 1987). In a study among young engineers, Keenan and Newton (1985) found that anxiety was seldomly reported, whereas anger and irritation, accompanied by feelings of frustration, were the most frequently reported emotions.

However, if these negative emotions are coped with adequately, they will have no long-term negative consequences for mental and physical health. Health damage is associated with the experience of prolonged, intense emotions that are considered undesirable. In addition, negative emotions are often produced by stress appraisals. Previous research has found higher levels of both perceived stress and actual stressful events are associated with negative mood (Stone, Neale & Shiffman, 1993). Smith & Sulsky (1995) found that employees' reported use of avoidance coping was associated with an increase in depressed mood and lower job satisfaction (Healy & McKay, 2000).

1.3.3 Models of Occupational Stress

In addition to the *Demand – Control model* (Karasek, 1979) discussed in detail in 1.6, a number of other models have focused on occupational stress. The most influential of these are discussed briefly below:

1.3.3.1 Person – Environment fit model. The theory underlying the Person – Environment fit model (P – E fit model) is also an example of a *mediational* perspective

on stress. The basic tenet of the model is that behaviour is a function of both the person and the environment (Lewin, 1935, 1951; Murray, 1938, 1959). According to the P – E fit model, occupational stress results due to a discrepancy ("misfit") between what the individual desires, and what the job supplies, or between job demands and the abilities of the individual to meet these demands. The model makes a distinction between subjective and objective misfit. Defence mechanisms are supposed to reduce the subjective misfit without any changes in the objective misfit, for instance by denial. In contrast, coping refers to strategies used for reducing objective misfit (Caplan, 1983; French, Caplan & Harrison, 1982), for instance, by learning new skills or by securing a lower workload. A significant assumption in the P – E fit model is that both a positive misfit, having more capabilities than are required or wanting less than is provided, and a negative misfit, having less capabilities than are required or wanting more than is provided, lead to stress (Chmiel, 2000). Thus, the model assumes a curvilinear relationship between fit and strains. In a number of studies such relationships as proposed by the model have indeed been found.

The model has been criticised on several grounds: Firstly, several aspects of the model have not been tested empirically (Chmiel, 2000). Specifically, since defence and coping are seldom measured there is little evidence for the existence of such mechanisms. Furthermore, usually only the subjective person and environment and not the objective person and environment are assessed (Cox & Ferguson, 1994). Baker (1985) asserts that the P – E fit model has little utility for predicting what work conditions are likely to result in stress. The model evaluates stress primarily in terms of individuals' needs, values, and abilities and ignores the fundamental role of environmental constraints. Consequently, it does not formally test which specific work characteristics cause stress; it can only demonstrate that individual perceptions mediate the basic etiologic relationship between objective workplace stressors and strain. In essence, the

model conceptualises occupational stress as a function of the individual rather than of the environment. The emphasis on individual perceptions is more consistent with a clinical psychological paradigm than with a public health approach to the prevention of workplace hazards. However, the primary strategy in stress research should be to identify conditions of work that cause stress in the average exposed worker.

In conclusion, the P – E model is weak in its predictive ability and maintains that the workplace, rather than worker, should be modified in order to prevent occupational stress. However, the focus on individual perceptions will not identify deleterious work conditions. Further elaborations are unlikely to rectify the essentially wrong orientation of this model (Baker, 1985).

1.3.3.2 Job Characteristics model. The job characteristics model is not a theory of job stress but it is a basis for job redesign, therefore it is relevant to stress. Hackman & Oldham (1976) originally proposed their Job Characteristics theory as a three-stage model, in which a set of core job characteristics (*skill variety, task identity, task significance, autonomy* and *feedback)* impact a number of critical psychological states (*knowledge of the actual results of the work activities, experienced meaningfulness of the work* and *experienced responsibility for the results of the work)*, which, in turn, influence a set of affective and motivational outcomes. The theory is a hybrid of the behavioural and systems approach and focuses on the objective characteristics of employees' jobs (Hackman & Oldham, 1980). This theory states that the most important determinants of satisfaction are intrinsic to the work itself (motivators such as achievement and personal growth) while determinants of dissatisfaction are extrinsic to the work itself (hygiene factors such as working conditions and company policies). The model specifies the conditions which will lead people to be intrinsically motivated to do their work. It specifies a path between core job dimensions, through psychological

states, to personal and work outcomes (such as high internal motivation, high quality work performance, high satisfaction with the work and low absenteeism and turnover). The job dimensions have practical implications for the redesign of jobs.

Interestingly, most subsequent research has omitted the critical psychological states, focusing instead, on the direct impact of the core job characteristics on the outcomes. Meta-analytic data from the thirteen studies that have investigated the full three-stage model was used as input into a structural equations modelling analysis (Viswesvaran & Ones, 1995), in order to examine competing versions of the job characteristics model and to determine the importance of the critical psychological states. Results suggested that, while the two-stage model demonstrates adequate fit to the data, information on critical psychological states is important for both theoretical and practical reasons.

A limitation of the model is that it does not address interpersonal, technical or situational moderators of how people react to their work. This may be problematic because Oldham found that interpersonal relationships were a critical moderator between job characteristics and internal motivation. Additionally, it applies only to jobs that are carried out independently, and cannot be directly used to design work to be conducted by teams, although it may be of some use. The basic notion of the theory is to build into jobs those attributes that create conditions for high motivation, satisfaction and performance. In addition, the theory acknowledges that individuals will respond differently to the same job. The dimension of *autonomy* that represents control, results in positive outcomes such as job satisfaction, high job performance and low absenteeism (Hackman & Oldham, 1976).

1.3.3.3 Vitamin model. This model was developed by Warr (1987). The basic tenet of the vitamin model is that, like vitamins, the absence of certain job characteristics will

impair employee mental health, and initially the presence of such characteristics will have a beneficial effect. However, a plateau is reached beyond a certain required level, with no further benefits or even harmful effects on mental health. Further increase of job characteristics may either result in a constant effect or may be harmful and impair mental health. According to Warr (1987, 1994) the type of effect depends upon the particular job characteristic under consideration. Furthermore, Warr (1987) postulated that affective well-being is an indicator of job-related mental health, with three dimensions: 1) discontented-contented, 2) anxious-comfortable and 3) depressed – actively pleased. In occupational settings, the first component has usually been operationalised mainly through measures of job satisfaction, the second component is usually assessed by measures of job-related anxiety, job-related tension and job-related strain, and the third component by measures of occupational burnout, job-related depression, job boredom and fatigue. In the Vitamin model individual characteristics are regarded as possible moderators of the effects of job characteristics on mental health, indicating that such effects would occur more for some individuals.

A number of cross-sectional studies investigating the patterns proposed by the Vitamin model (Fletcher & Jones, 1993; Parkes, 1991; Warr, 1990; Xie & Johns, 1995) have produced mixed and inconclusive results. Job demands and job control seem to be curvilinearly related to some aspects of employee mental health in the way that is predicted by the model, whereas the effect of workplace social support does not follow the model. Furthermore, all studies have failed to take account of the possibly multifaceted ways in which the nine job characteristics may affect job-related well-being. In addition, longitudinal studies have not been reported yet, which means that causal orders in associations still need to be proved. Finally, there has been no empirical evidence for the interactions between individual and job characteristics as related to employee health within the Vitamin Model (Chmiel, 2000). In conclusion, the model is

purely descriptive and does not provide any mechanisms for dynamics of stress-strain relationship.

1.4 Stress and the Nursing profession

Haynes, Wall, Bolden, Stride & Rick (1999) emphasised the significance of investigating work stress among health care professionals, for both theoretical and practical reasons: First, evidence suggests that health care employees experience high levels of strain (Bond, 1984; Charlton, Kelly, Dunnell, Evans & Jenkins, 1993; Hingley, 1984). A large-scale investigation covering all major occupations within the NHS provider units found that doctors, nurses and managers report higher levels of minor psychiatric disorder than their counterparts in the general working population (Wall, Bolden, Borrill, Carter, Golya, Hardy, Haynes, Rick, Saphiro & West, 1997). Furthermore, and perhaps most importantly, health care employees are likely to encounter the full range of exposure to many work factors theoretically implicated as determinants or moderators of strain. Due to the nature of their job, health care employees experience more extreme levels of role conflict, role ambiguity or work demands than employees in other professions. Revans (1976) described hospitals as being characterised by anxiety and referred to the cycle of anxiety, uncertainty and communication blockage, which appeared related to relationships between nurses at different levels in the hierarchy, staff turnover, and patient's well-being (McGrath, Reid & Boore, 1989).

Focusing on the nursing profession, several features of this occupation make it more suitable for the study of work stress and testing the demand – control model in particular (Fox, Dwyer & Ganster, 1993). First, a bulk of evidence indicates the prevalence of stress-related symptoms such as absence, job dissatisfaction, turnover, performance decrements, and depression, among nurses (Gray-Toft & Anderson, 1981;

Jamal, 1984). Second, several stressors and job conditions associated with the nursing profession may be measured objectively (Norbeck, 1985). Finally, due to the significant variance in the exposure of stressors across nursing departments, adequate tests of relationships are possible (Stehle, 1981).

Studies of occupational stress in nurses have revealed a number of common stressors in this population. Two acknowledged sources of stress for all nurses are heavy workload and the death of patients (Hipwell, Tyler & Wilson, 1989; Tyler, Carroll & Cunningham, 1991; Tyler & Cushway, 1992). The death of patient also threatens role perceptions by confronting the nurse with an unacceptable view of him or herself as a failure (i.e. failing in the job of healing a patient) (Hemingway & Smith, 1999). Furthermore, it is well documented that both role conflict and role ambiguity are inherent in the nursing role (Gray-Toft & Anderson, 1981a). These may arise from opposing demands by the medical and administrative staff and from conflict between their role functions (Hemingway & Smith, 1999).

Stressors such as lifting (Scholey, 1983), disturbance of life-style and circadian rhythms by night duty (Folkard & Haines, 1977), overheated conditions in theatre, and ethical dilemmas related to critical care units (Lawrence & Farr, 1982) and long-term care of the aged (McGrath *et al.*, 1989) have been reported. The nursing profession is additionally characterised by shortage of staff, work overload, too much administrative work, lack of support from superiors and peers, uncertainty concerning treatment (Tsai, 1993; Tyler & Cushway, 1995; Simoni & Patterson, 1997). These stressors were found to be negatively related to nurses' physical and psychological well-being (Boswell, 1992; Carson, Leary, DeVilliers, Fagin & Radmall, 1995). Previous studies also indicated that high levels of work stress were consistently associated with low job satisfaction (Blegen, 1993). Boey (1998) emphasised the significance of job satisfaction to the nursing profession for the following reasons: Low job satisfaction is likely to lead

to absenteeism (Rees & Cooper, 1991; Petterson, Arnetz & Arnetz, 1995) and a high turnover rate (Sommers, 1996), which would further exacerbate the stress from staff shortages and work overload. Secondly, and most importantly, low job satisfaction adversely affects the quality of patient care (Relf, 1995; Mindak, 1996).

Fortunately, the number of investigations into nurses' work dimensions and their relationship with nurses' reaction variables like job satisfaction, psychological and psychosomatic complaints, self-reported stress, burnout and absenteeism, is increasing (Landeweed & Boumans, 1994). Kosmoski & Galkin (1986) found that the scores on a number of job satisfaction dimensions increased as the nurses' influence on decisions regarding their work increased. Munro (1983) found that the best predictors of nurses' job satisfaction were the degree of responsibility and the quality of working conditions.

1.5 Nursing in Greece

Greece is a southeastern European country and has been a member of the EU since 1981. It has an area of 132.000 square kilometres and a population of 10.264.000, as of 1991. In the same year, infant mortality was estimated at 9 per 1000 live births (OECD, 1993). The main causes of death are heart disease, malignant neoplasms, cerebrovascular disease and accidents (Papamicrouli, 1993). Life expectancy was 76.7 years in 1988-89, the most recently available data (WHO, 1996). These satisfactory health indicators are more attributable to the good climate and the healthy nutrition, than to the contribution made by the health services. The health system in Greece has for many years been in a state of continuous crisis. The basic aspects of this crisis involve: a fragmented administrative framework; low level of public expenditure; a significant private sector; inadequate hospitals; skewed manpower; and a low level of primary health care (Tountas, Stefannson, Frissiras, 1995). As a result of the above-mentioned problems, there was increased awareness of the necessity to improve the health system

and various attempts at reform have been undertaken over the last thirty years. The establishment of the National Health System (ΕΘΝΙΚΟ ΣΥΣΤΗΜΑ ΥΓΕΙΑΣ) (ΕΣΥ) in 1983 was part of an attempt to improve the situation (Tountas *et al.*, 1995).

However, even after the introduction of ΕΣΥ, problems continued to exist. One of the problems involves the over-concentration of hospital services in the large urban areas of Athens, Thessaloniki and Patras. According to Sissouras & Megalokonomos (1995), from the 65000 hospital beds that exist, 70% are occupied in the large cities.

In addition, the Greek health system is characterised by a significant private sector that did not simply function as an addition to the public sector but often undermined the function of the public sector (Kalokerinou, Sourtzi & Lanara, 1998; Vasilios, 1995). Private hospitals have better management, provide higher salaries to the workforce than the public hospitals and employ more qualified nursing staff (Mihalos, 1997). It has therefore been suggested that the quality of care would be better in private hospitals (Bakalis, 2001; Papastaurou, 1996).

1.5.1 Nursing education in Greece

There are two levels of nursing education in Greece. The first level general nurse – *registered nurse-* is educated through diploma or degree programs. The diploma program lasts for three and a half years in Technological Educational Institutes of Higher Education (TEIs) while the degree program involves a four-year education in a University. The same entrance qualifications are required for both programs – 12 years of schooling and national exams – and there is no difference in clinical practice between the two, apart from small salary discrepancies. However, nurses finishing the University program have the opportunity for an academic career as well. The second-level nurse – *assistant nurse* – is educated for two years in professional schools after the nine years of compulsory general education (Kotsabassaki, 1993). Greece was the first country in

Europe to require a full secondary education for entrance to nursing education (Zirogiannis, 1991). Nursing degrees and diplomas are recognized in any other member state of the European Union, without additional requirements (Kalokerinou *et al.*, 1998). Continuing education is not regulated by Law, but seminars are organized in most hospitals and are the responsibility of the Director of the Nursing Service. The Greek nurses' license is for life and does not depend on continuing education. Lemonidou, Mantas & Liatsou (1996) reported that the time registered nurses spent on both education and research activities was disappointing (1.3% and 0.0% respectively).

According to the MoH (1997) there were 15000 medical and 47000 nursing staff approximately working in ΕΣΥ, of whom 25000 were qualified nurses and midwives, 12430 assistant nurses (enrolled nurses) and 9290 practical nurses (auxiliary nurses) (Bakalis, 2001). Forty five per cent of the personnel in a large hospital will be nursing personnel. However, although new nursing positions are established in the health services, assistant nurses - due to the shortage of graduate nurses - take these, resulting in problems for the nursing service (Papamicrouli, 1993).

Nursing as a profession does not enjoy high prestige. Due to shortage of nurses, the pressure of work and poor organization of the services, the majority of graduate nurses are characterized by low job satisfaction and many leave when given the opportunity. It is estimated that the average time a nurse remains in the profession is very short, however, there are no reliable figures available (Papamicrouli, 1993). Nurses work seven and a half hours a day, or thirty-seven and a half hours over a five-day week, as all employees in the public sector. Nurses are doing shiftwork and there are three shifts in the hospitals, morning shift, afternoon shift and evening shift (Papamicrouli, 1993). Qualified nurses are graded on a 1 to 30 credits scale (Hellenic Nurses Association, 1996). At the beginning of their career they have one credit and every year their grade increases by one credit. In order to move higher in the hierarchy

they usually need six to seven credits. If the nurses have qualifications such as postgraduate degrees they take two credits each year. Nurse's salaries range from 500 pounds to 900 pounds and this is determined by the number of credits they have and the years of experience. Paid maternity leave is given for two months before and two months after childbirth (Bakalis, 2001).

Nurses in Greece have been given the responsibility of caring for people. Therefore their responsibility lies in seeing patients within their normal environment and not within the isolation of a diagnosis (MoH, 1997). However, their personal view on nursing and the perception of their role determines the extent to which they accept this responsibility (Robinson, Gray & Elkan, 1992). On the other hand, most hospitals are physician-run (Papastaurou, 1996) and the fact that nursing depends on medicine for the knowledge that underpins its practice results in a lack of autonomy (Kotsabassaki, 1998). Consequently, the relationship between the physician and the nurse is not a mutually respectful one and nursing has been regarded as a dependent occupation (Papastaurou, 1996). The nurse is often described as an assistant to doctors, secondary and subordinate. In addition, the competence of the nurse has been underestimated, possibly due to unclear role definition. Frequently, what the nurse is appointed to do by Presidential Law does not coincide with what she is expected to do in a changing situation or in a situation characterized by staff shortage (Bakalis, 2001; Lanara, 1998).

There are a number of problems that restrict the role of the nurse. Nurses do not have explicit roles, they lack authority and lack motivation to change the situation. In addition, they do not have support from other disciplines and no legal statements exist protecting the nurses from going beyond their roles (Lemonidou, 1997). In addition, another fundamental problem arises from the shortage of qualified nurses. Due to this shortage, assistant nurses are given more authority and are permitted to work as

qualified nurses, although they do not have the same clinical experience (Lemonidou, 1997).

In conclusion, nurses in Greece are under daily work pressure, they do not want to challenge medical authority and lack personal motivation for seeking autonomy and developing new ideas (Haralambidou, 1997). Additionally, as previously mentioned, the social status of the nurse is low in Greece (Papamicrouli, 1993) and this contributes to the difficulty of changing the situation.

1.6 The Demand – Control model of Job Strain

The following discussion will concentrate on the *demand – control* model (Karasek, 1979), which is the basis of the present research. As will be demonstrated below, due to its simplicity and broad applicability, the model has become very influential and has generated an exceptional amount of empirical research. It can, therefore, serve as a foundation for the examination of dynamic stress – strain relationships.

The demand – control model of the psychosocial work environment (Karasek, 1979) is a synthesis of two prominent lines of research, the P – E model (Caplan, 1983; French *et al.*, 1982) and the Job Characteristics model (Hackman & Oldham, 1980). The nature of the model is socio-psychological and the model itself originated from the field of occupational health (De Jonge, Janssen & Van Breukelen, 1996). Karasek's (1979) model has provided a solid theoretical basis for most major studies of occupational stress conducted in the past twenty years (Beehr, Glaser, Canali & Wallwey, 2001).

The focus of early research on health effects of the psychological features of work organisation was on specific stress-inducing features of certain professions such as noise and time pressure. Consequently, no integrating framework was provided and this

atheoretical approach did not allow any generalisations across different work settings to be made. The demand – control model on the other hand, provided the conceptual framework for estimating two dimensions central to all jobs: *Psychological demands* and *decision latitude* (or *control* over work). These two dimensions provide a fairly accurate reflection of the psychosocial characteristics of work environment and are associated with a broad range of health outcomes (Muntaner & Schoenbach, 1994).

The basic form of the model specifies two broad constructs that can vary independently in a work environment, job demand and job control. The *job demand* dimension refers to workload, and has been operationalised mainly in terms of time pressure (whether there is enough time to perform the job, how hard and fast the person has to work, the level of concentration required, and the amount of interruptions and conflicting demands) and role conflict (Karasek, 1985; Van der Doef & Maes, 1999). While admitting that *job demands* "remain difficult to conceptualise and to measure", Karasek & Theorell (1990: 63) assert that the central component of *job demands* is a task's mental workload and the mental alertness or arousal needed to carry out the task.

The *decision latitude* or control over work dimension has two components: *skill discretion* (the degree to which the job involves learning new things, novelty, routinization, creativity and development of the individual's special abilities), and *decision authority* (the individual's freedom to make decisions about his or her own job, and to influence the work group or company policy) (Muntaner & Schoenbach, 1994).

Along with the empirical evidence supporting the link between the demand – control model and health outcomes several additional dimensions of job conditions have emerged. In particular, the degree of *social support* has been found to modify the relationship between the original demand – control dimensions and health (Green & Johnson, 1990; Johnson & Hall, 1988). Johnson & Hall (1988) included *social support* in the theoretical model and in a study of cardiovascular disease prevalence in a large

random sample of Swedish men and women they reported that the joint action of high demands and lack of control -(*decision latitude*) is of particular importance to blue-collar men, whereas the joint action of lack of control and lack of support is more important for women and white-collar women. They developed the concept of "isostrain" (Johnson & Hall, 1988), whereas the highest stress level is expected under conditions of high demands, low perceived control and low social support and tested the multiplicative interaction between all the three aspects (demands x lack of control x lack of support) in a 9-year prospective study of 7000 randomly selected Swedish working men. Their findings indicated that the men with the low demands, good support and good decision latitude (20% of the sample) showed slow progression of cardiovascular mortality with increasing age. In blue-collar workers, however, the age progression was much steeper in the worst iso-strain group than it was in the corresponding iso-strain group in white-collar workers (Johnson, Hall & Theorell, 1989; Theorell, 1996).

1.6.1 Predictions of the demand – control model

The first major prediction of the demand – control model has been that job strain, a stress outcome reflected in mental and physical health problems, occurs when jobs are simultaneously high in demands and low in controllability (*high-strain jobs*). The reasoning behind this prediction is that high *demands* produce a state of arousal that may generate responses such as elevated heart rate or adrenaline exertion (Jex & Beehr, 1991). If the worker's responses are restricted, as would occur under conditions of low control, the arousal cannot be appropriately channelled into a coping response and an even larger and persistent physiological reaction is produced. This combined effect is described as an "interaction", indicating that this co-occurrence is linked to significantly lower well-being that would be expected from the simple additive combination of the two factors (Warr, 1990). The above prediction has been tested in a number of

epidemiological studies, which, with the exception of that of Reed and associates (Reed, LaCroix, Karasek, Miller & MacLean (1989), confirm the relevance of this two-dimensional distinction (Karasek, 1979; Pieper, LaCroix & Karasek, 1989; Schnall *et al.*, 1990).

The second prediction of the model is that an *active job* (Karasek, 1979), one with high levels of both psychological demands and controllability, is associated with positive outcomes such as motivation, learning and healthful regeneration. The condition in which the individual has low control while occupying a low demand job has been labelled *passive* and Karasek argued that it would generally be dissatisfying. Individuals' adaptation to low control and low demands situations over time results in inability to make judgements, solve problems and face challenges. However, increasing worker control, even in low demand situations, can cancel out tendencies towards learned-helplessness and transform a job into what Karasek termed a *low-strain* job (Warr, 1990). A graphical representation of the demand-control model is illustrated below (Figure 1.1).

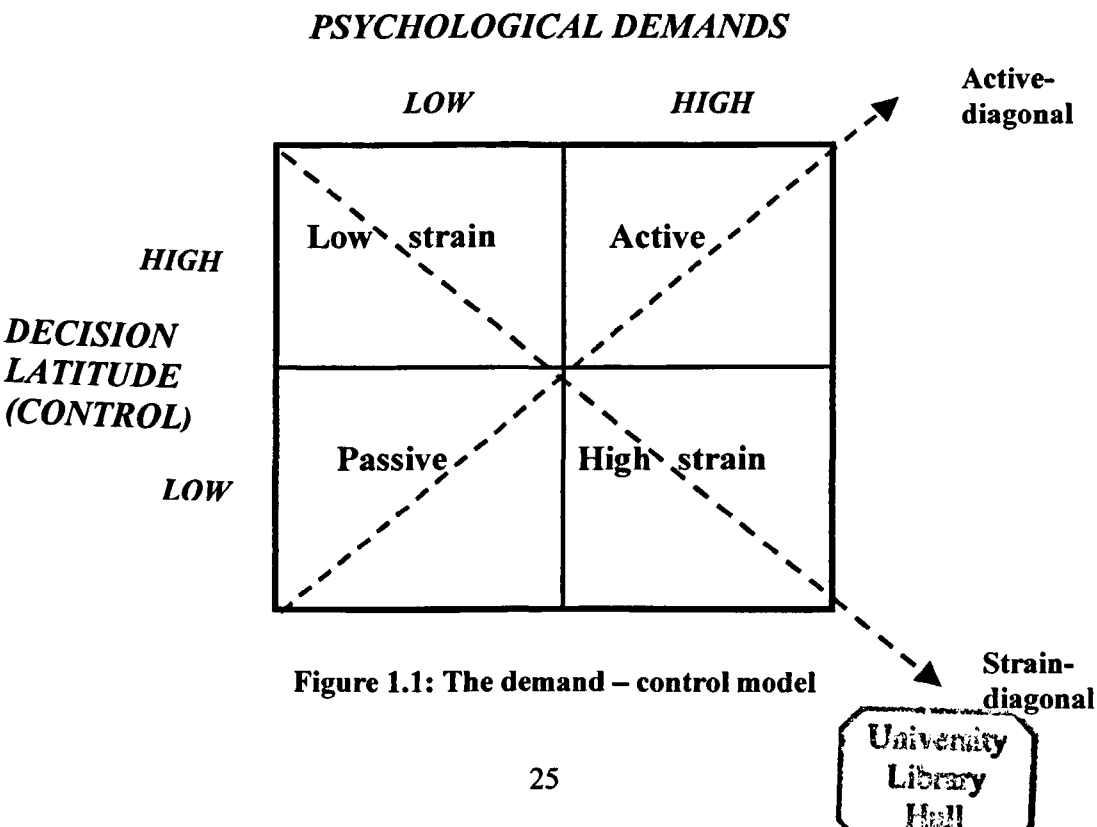

Figure 1.1: The demand – control model

As a specific theory of occupational stress, the model has filled the middle ground between two broader theoretical perspectives. The epidemiological perspective (Kasl, 1986) stresses the identification of epidemiologically significant occupational risk factors, rather than the comprehension of the phenomenology of the stress experience. The cognitive appraisal model (Lazarus, 1991) concentrates on the understanding of the cognitive processes that mediate the effects of environmental events on mental and physical health. The demand – control model has bridged these two perspectives to some extent (Xie, 1996).

Karasek's (1979) model is the most influential in the research on the psychosocial work environment, stress and disease and has been tested in well over 100 studies (Kristensen, 1995). The model has mainly been employed in studies of cardiovascular disease or cardiovascular risk factors. Between 1981 and 1994, 16 studies of job strain and cardiovascular disease were published. Nevertheless, a considerable number of studies employing the model examined other endpoints such as exhaustion, depression, fatigue, work dissatisfaction, distress, sleeping problems, anxiety, absenteeism, alcohol-related diseases, psychiatric illness, cancer, occupational accidents and mortality.

1.6.2 Epidemiological and individual-level studies of the demand – control model

Both epidemiological (occupation-level) studies and individual (self-report) studies have been carried out in order to test the demand – control model (de Jonge *et al.*, 1996). These have been cross-sectional or longitudinal. A review of the longitudinal studies of the demand – control model will be presented in section 3.2.3.

Epidemiological studies are usually large-scale examinations of national surveys that mainly focus on cardiovascular diseases. These studies typically use objective measures of demands, control and strain either through the use of national surveys or

occupationally defined measures or by aggregating self-report data to population levels (Karasek, 1979). Several reviewers (Ganster & Schaubroeck, 1991) have pointed out that the epidemiological studies that investigate the biological mechanisms that link occupational stressors and disease outcomes, offer more evidence for the model than the individual studies (Fox, Dwyer & Ganster, 1993; McLaney & Hurrell, 1989; Parkes *et al.*, 1994; Warr, 1990).

Parkes *et al.* (1994) found that the interaction between demands and discretion predicted job satisfaction. However, there is little evidence in support of the postulated interactions in any of these studies. As Fox and colleagues (1993) and Landsbergis, Schnall, Warren, Pickering & Schwartz (1994) observed, the epidemiological studies that did find support for the model have not explicitly tested the interaction between demands and control. Tests of the demand – control interaction have been inappropriately liberal since the main effects of demands and control were not controlled for. Furthermore, it has been argued that confounding factors such as socio-economic status and health behaviour of the workers may have been involved (Schaubroeck & Merritt, 1997). The latter point will be discussed further later on.

Karasek's simple additive combinations have been reported by Kaupinnen-Toropainen, Kandolin & Mutanen (1983); Perrewe & Ganster (1989); Carayon (1993) and Fletcher & Jones (1993). Ganster & Fusilier (1989) have reached the conclusion that the empirical validity of the interactive model has not yet been established.

The focus of the individual level self-report studies is on attitudinal outcomes (job satisfaction, work motivation), behavioural outcomes (absenteeism and smoking consumption) and physiological outcomes (blood pressure and muscle tension). The individual-level studies also provide mixed evidence. Several researchers that used self-report measures of affective outcomes (job satisfaction, depression, anxiety and somatic complaints) have failed to provide support for the interactive model (Hurrell &

McLaney, 1989; Payne & Fletcher, 1983; Spector, 1987; Tetrick & LaRocco, 1987). An explanation for this lack of support for the interactive model has been put forward by Ganster & Schaubroeck (1991a). They suggested that the individual characteristics of the respondents might have confounded the results of the studies.

In conclusion, evidence suggestive of an interactive effect between demands and control in predicting strain has mainly come from large-scale multi-occupational studies (Schnall *et al.*, 1994). Smaller scale studies conducted in homogeneous samples of teachers (Payne & Fletcher, 1983), prison officers (Morrison, Dunne, Fitzgerald & Clogan, 1992), steel pipe mill workers (Perrewe & Anthony, 1990), clerical workers (Spector, 1987) and nurses (Hurrell & McLaney, 1989) have reported main effects of demands and control on strain measures.

In relation to the above, Karasek (1989) claimed that since a single occupation is characterised by limited variance on the independent measures, the interaction test within homogeneous samples would be over conservative. On the other hand, Ganster & Fusilier (1989) argued that analyses done at the occupational level are neglecting the variability in job characteristics within occupations. They further argue that since stress interventions do assume variability in job characteristics, the demand – control model should be able to predict difference in the levels of strain between individuals in the same occupation. Consequently, they conclude that occupationally homogeneous samples would be more adequate in testing the model, since several potentially confounding variables that have overloaded epidemiological studies can be accounted for (Ganster & Fusilier, 1989; Spector, 1987).

Karasek has provided only limited empirical support for his hypothesis. In his first study (Karasek, 1979) he found significant regression interaction terms for job and life satisfaction, exhaustion and depression, using large general samples cutting across many jobs. In a later study of coronary heart disease Karasek and his colleagues

(Karasek, Baker, Marxer, Ahlbom & Theorell, 1981) found main effects of discretion and demand. However, they did not specifically test the interaction hypothesis.

Further attempts have been made to demonstrate the interactive effect of discretion and demand on health outcomes. In their study of schoolteachers, Payne & Fletcher (1983) developed a demand scale specifically for them, including work pressure, demands from others and specific demands of teaching. Control was operationalised as autonomy on the job. Five negative outcomes were studied, including depression, anxiety and somatic symptoms. The results showed additive rather than interactive effects of job conditions on the outcomes. Landsbergis (1988) applied the model to hospital and nursing home employees and also found no support of the demand-control interaction. A study of employees of a state-wide banking system by Beehr & Dexler (1986) failed to demonstrate the demand-control interaction. However, the stressors they used – role overload, role ambiguity and role conflict – did not represent the job demands concept as defined in the demand – control model. While their outcome variables – three facets of job satisfaction and job search intent – were not clearly aspects of psychological strains (Beehr *et al.*, 2001).

Perrewe & Ganster (1986) conducted a laboratory study in which demands and control were manipulated. Their outcome measures included satisfaction, anxiety and physiological arousal. Their findings indicated main effects of perceived control and demands on the outcome measures but only one interactive effect out of the twelve tested reached statistical significance. Karasek, Triantis & Chaudhry (1982) applied the model to a large US workforce. Their results indicated that control moderated the relationship between demands and life satisfaction, job dissatisfaction and job-related moods. However, control did not moderate the relationship between demands and depression, an outcome more closely related to psychological strain. Thus, whether the study provided support for the model is unclear. In their study of blue-collar employees

Dwyer & Ganster (1991) found an interactive effect of perceived workload and control on absence, tardiness, sick days and job satisfaction. However, the above outcomes are also not psychological strain variables. In their study of nurses, Fox, Dwyer & Ganster (1993) reported interactions between perceived quantitative workload and control as predictors of job satisfaction, systolic and diastolic blood pressure and cortisol levels. However, the outcome measures studied are not direct indicators of strain. Mullarkey, Jackson, Wall, Wilson & Grey-Taylor (1997) applied the model to computer operators and found that timing and method control moderated the relationship between ambiguity-type stressors (technical uncertainty and technical abstractness) and job-related anxiety, job-related depression, psychological strain and job satisfaction. However, the effects depended on the measure of demands and control used. Additionally, the stressors used in that study do not represent the demands suggested in the theory. In their study of university employees holding administrative positions, Sargent & Terry (1998) did find support for the demand – control interaction.

Finally, a study by Wall *et al.* (1996) on British manufacturing employees provided clear support for the demand-control interaction. More specifically, their results indicated that timing control and method control moderated the impact of demands (monitoring and problem-solving demands) on job anxiety, job depression and job satisfaction. The measures of demands and control they used were developed by Jackson, Wall, Martin & Davids (1993) and were considered more appropriate for testing the model. When decision latitude from the Intrinsic Job Characteristics Scale of Warr, Cook and Wall (1979) was used instead of control, they did not find any support for the interaction. Consequently, their findings emphasise the appropriateness of control as a moderating variable, rather than the broader construct of decision latitude that includes some skill variety in it (Beehr *et al.*, 2001). In a similar vein, de Jonge, Janssen & Van Breukelen (1996) found the predicted interaction effects in a relatively

small sample of health care workers using a more precise and multifaceted measure of job control. Such interaction effects were replicated in another sample of health care professionals using the same focused measure of job control (de Jonge, Mulder & Nijhuis, 1999). Overall, however, there is only modest support for Karasek's interaction hypothesis. Van der Doef & Maes (1999), in their detailed review of 63 studies of the demand – control model that used psychological strain as the outcome and were published between 1979 and 1997, found that from the 31 studies that hypothesised the interaction, only 15 at least partially supported it (Beehr *et al.*, 2001). Only two (Wall *et al.*, 1995; Wall *et al.*, 1996) obtained interaction effects for all their outcome variables.

1.6.3 Critical evaluation of tests of the demand – control model

Warr (1987) has argued that there is a lack of clarity on the terms "interactions" and "joint effects" of demands and decision latitude as used by Karasek. Although initially these terms indicate an additive or subtractive interaction (Karasek, 1979, 1989), the model additionally proposes that job demands and decision latitude combine synergistically. Consequently, the combination of high job demands and low job control should be statistically more powerful than an unweighted addition or subtraction of the two variables.

As was previously noted, a frequent criticism of the occupation-level research of Karasek and others in the epidemiological tradition is that there are large differences in socio-economic status across occupations. Socio-economic status factors may confound findings, since they affect health and longevity (Fox *et al.*, 1993; Xie, 1996). Additionally, it is possible that jobs that are simultaneously high in demands and low in control will be over represented by employees of low socio-economic class and status (Schaubroeck & Merritt, 1997). Findings reporting lack of any significant interaction of demands and control in large-scale studies that controlled for the level of the job,

support the above criticism (Karasek *et al.* 1981; Reed *et al.*, 1989). It was concluded that although using a single occupation to test the model would minimise the confounding effects of socio-economic status, the variance in job demands and control would be less than in large multi-occupational studies.

Another common criticism of the model is that, although it offers a simple description of the recognised causal factors affecting health in the work environment, it is too simple as it excludes important variables (Baker, 1985; Johnson, 1989). Johnson (1989) argued that work-related support may also function as a moderator of job demands and suggested the inclusion of this variable in the model. Karasek & Theorell (1990) have incorporated this criticism into their recent formulations. On the other hand, if too many explanatory variables are included, replicating findings and conducting interdisciplinary research becomes problematic. Muntanter & Schoenbach (1994) note the necessity of reducing the empirically relevant variables to a parsimonious set of theoretically meaningful dimensions.

It has been argued that the use of different methods may result in different findings in terms of the interactive effects (Kasl, 1996; Landsbergis, Schnall, Warren, Pickering & Schwartz, 1994; Parker & Sprigg, 1999). The two most common methods of testing the model have been analysis of variance and regression analysis. Analysis of variance has been carried out with two independent factors, the level of job demands and the level of job control (Sauter, 1989) and this method frequently produces results that are supporting the model. However, it has been argued that interactions ideally should be tested with moderated regression analysis (Cohen & Cohen, 1983; Zedeck, 1971; Aiken & West, 1991; Landsbergis *et al.* 1994). It was concluded that the power differences between the different statistical methods might explain the differences in the findings (de Rijk *et al.*, 1998).

Another explanation for the inconsistent findings in terms of the interaction effect has been that one or more moderator variables such as personality characteristics that influence relations between job characteristics and outcomes. Several research studies have begun to investigate these moderating effects, some of them with quite promising results (see Johnson, 1989; Jones & Fletcher, 1996; Parkes, 1991, De Rijk *et al.*, 1998).

An alternative explanation for the lack of consistency in the results has to do with the assessment of job characteristics (De Jonge *et al.*, 1999). The job characteristics of the model have been measured in 2 different ways: 1) "objective" and 2) "subjective" (Karasek & Theorell, 1990; Kristensen, 1995). The "objective" job characteristics are assessed independently of the job incumbent (Frese & Zapf, 1988, 1994; Spector, 1992) and may be physical and social characteristics of the work environment or expert ratings. Accordingly, "subjective" job characteristics are mostly reliant on the cognitive and emotional processing of the employee and on his/her ability in coping (Frese & Zapf, 1988).

Currently, the objective method is carried out through independent measurement and observer's ratings (Kristensen, 1995; Schnall *et al.* 1994; Theorell & Karasek, 1996). Warr (1987) has argued that the main problem associated with the direct measurement of objective characteristics is that it is difficult to express some aspects in concrete physical terms. For instance, job autonomy and job clarity do not provide usable general markers. One of the problems associated with the second approach is observers' bias. According to Frese & Zapf (1988) this type of measurement produces incomplete and partially invalid information, due to the limited observation time and the effects of the observation itself. In addition, it has been suggested that observers' rating suffer from stronger halo and stereotyping effects than subjects' assessments (Frese, 1985; Semmer, Zapf & Greif, 1996).

On the other hand, the subjective method of assessment has several problems as well. One of the main problems is positive information bias, since workers with poor health and poor psychological well-being tend to report more stressors than workers with good health. Additionally, workers with good health may under-report job stressors, which will result in reinforcing the positive bias. This problem is of special importance in cross-sectional studies (Kristensen, 1995).

Several researchers have suggested that the key variables (demand and control) are too vague and wide-ranging (Wall *et al.* 1996; Jones, Bright, Searle & Cooper, 1998). Different researchers conceptualise and measure job demands in a number of different ways (de Rijk, 1998). Various types of job demands such as workload (Fox *et al.* 1993) and interpersonal conflicts (Spector, 1987) have been used to represent the concept of job demands.

More importantly, it has been argued that Karasek's (1979, 1986) original scale includes both purely descriptive and affective items and this may result in spurious relationships with the dependent variables (Wall *et al.*, 1996). They note that "such common measurement variance increases the main effects of job demands on psychological strain, which in turn restricts the opportunity to demonstrate any underlying interaction between demands and decision latitude". In support of the above, the majority of the studies that reported interactive effects did not use affective items. For instance, Dwyer & Ganster (1991) did find interactions in their study; however, job demands were measured through job analysis therefore removing the possibility of affective bias. Similarly, Parkes *et al.* (1994) reported interactions, however the researchers have controlled for affectivity in their statistical analysis.

In addition, several researchers have pointed out a fundamental problem associated with Karasek's original measure of decision latitude. They have observed that decision latitude is a mix of job control, skill variety and job complexity (Frese,

1989; Ganster, 1989) and these dimensions are quite different (Kasl, 1996). Several researchers attempted to refine the concept and have developed specific measures that can be applied to a range of industrial jobs. Evidence suggests that studies using a more refined measure of job control provide support for the interactive hypothesis of the demand – control model (Wall *et al.,* 1996). This will be discussed further in chapter 2.

Related to the use of more specific measures of the key variables may be the need to develop new measures that relate to different types of job. Söderfeldt, Söderfeldt, Jones, O'Campo, Muntaner, Ohlson & Warg (1997) suggest that the basic concepts need further development in human service organisations in order to consider emotional demands as well.

Another point of criticism relates to the use of self-report measures for the assessment of predictors and outcome variables (Xie, 1996). This entails the possibility of common method variance. However, it was suggested that there is no theoretical reason to expect an interaction from common method variance. Evans (1985) pointed out that correlated error can moderate true interactions but cannot create spurious interactions.

A further methodological issue that concerns all studies but has been put forward for the study of the demand-control model as well is the use of cross-sectional data. Any cross-sectional study is not an adequate basis for conclusions regarding causality. In addition, job demands and job control are chronic factors (Xie, 1996). Several researchers have emphasised the necessity for longitudinal research for the examination of the joint effects of job demands and control on physical and mental outcomes for employees in both the short and the long run.

As described above, methodological explanations have been put forward to account for inconsistent findings in terms of the interaction effects of the demand-control model (Beehr *et al.*, 2001; Parker & Sprigg, 1999; Van der Doef & Maes, 1999).

A further more theoretical explanation arises from the observation that individuals adapt in different ways to the environment and that these differences may have an influence on the process of occupational stress (Parkes, 1990, 1994; Siegrist, Peter, Junge, Cremer & Seidel, 1990). Thus, a crucial but largely overlooked issue regarding the demand – control model concerns the role of individual differences in the interaction of job demands and control (Van Yperen & Snijders, 2000; Xie, 1996).

Karasek's model postulates that individuals who have high control will tolerate aversive events even better than those who do not. On the other hand, there is evidence suggesting that there is no ideal level of demands or control that fits all individuals equally. In terms of demands, research has indicated that individuals prefer different levels of demands, due to variations in education, job tenure (Schuler, 1980), their perception of the fit between their ability and job (Abdel-Halim, 1982), self-esteem (Ganster & Schaubroeck, 1991), hardiness, locus of control and type A behaviour (Ganster & Schaubroeck, 1991). Conversely, individual differences in the preferred levels of the decision latitude dimension have not been investigated extensively (Van der Doef & Maes, 1999). There are indications, however, that some individuals find decision latitude more desirable than others. Hackman & Oldham (1976) noted that individuals with a high need for personal growth and development respond in a more positive way to jobs that are high in complexity than individuals with low *growth need strength.* Given these individual differences, it is plausible to question whether *control* plays the same buffering role for all individuals (Van der Doef & Maes, 1999).

A number of individual differences variables have been studied and shown to moderate the effects of demand and decision latitude. Parkes (1991) applied Karasek's model to a sample of civil servants and reported interactive effects of demands and discretion on anxiety for individuals with external locus of control but not for those with internal locus of control (Jones & Fletcher, 1996). Furthermore, it has been suggested

that processes in the demand – control model are moderated by proactive personality (Parker & Sprigg, 1999). Two recent articles support the above suggestion. First, Schaubroeck and Merritt (1997) found that self-efficacy moderated the demands-control relationship when predicting blood pressure. In a second study by de Rijk *et al.* (1998), active coping was found to moderate the demands-control interaction when predicting burnout among nurses.

1.7 Conclusions

In conclusion, it should be stressed that the basic intention of the demand – control model was not to explain all work environment related illness. The model mostly looked at the way in which work is organised, and the way in which this relates to illness. It is this simplicity that made the model useful in organisational work. If the intention was to explain "all of the variance" the model would have to be more complex and would be scientifically more, but educationally less, successful (Theorell, 1996).

This chapter addressed fundamental issues pertaining to occupational stress, presented alternative models of occupational stress and discussed the methodological criticisms linked to these models. It concluded with a thorough theoretical and methodological examination of the model under investigation in the present study, the demand – control model. The next chapter will provide a detailed literature review of the key constructs that are related to the demand – control model and will be used in the present study.

CHAPTER 2

KEY CONSTRUCTS IN TESTING THE DEMAND – CONTROL MODEL

2.1 Introduction

The foundations of the present study are derived from the psychological, organizational and occupational health literatures that relate to the individual and organizational aspects of job stress. From this wider area a more specific range of concepts is particularly useful. The purpose of this chapter is to present the key literature and build the foundation for later discussion. Consequently, the constructs that are central to the demand – control model will be explored in detail and the way they have been developed in recent treatments will be discussed.

In particular, the development of more validated measures for demands and control and support and their operational definitions as used in stress studies are presented. Further, the way these constructs are mapped on to different work environments is noted.

2.2 Demands

The concept of demand has a central role in current theories of effects of stress on health and performance (e.g. Karasek & Theorell, 1990). The term *job demands* refers to externally generated tasks that have to be completed in order to achieve targets or goals and is used frequently in the occupational stress literature. Minimally, the management of demands is associated with coping – an appraisal of the event(s) as posing a potential threat to current goals, and the adoption of a suitable plan of action (Lazarus & Folkman, 1984).

The construct of job demand reflects the organisationally determined aspects of work. These aspects identified in any given occupation can be further classified into 2 categories, "qualitative" psychological or intellectual demands, and "quantitative" physical or time pressure demands (Karasek & Theorell, 1990). Psychological demands comprise deadlines, challenges, expected performance or stresses arising from personal conflict. Karasek and Theorell (1990) note that the central components of psychological job demand are task requirements, or workload. Karasek (1989) argues that job demands are associated with strain while job control alleviates the negative impact of job demands (Munro, Rodwell & Harding, 1998). Although a fast and hectic work pace may entail physical requirements that are linked to fatigue, the demand – control model predicts the stress-related outcomes that are linked to psychological effects of workload. These may involve the anxiety associated with the need to maintain the pace of work and the associated consequences of failing to complete the job. There is considerable evidence to suggest that psychological demands have a major impact upon health outcomes of work activity (Karasek, Gardell & Lindell, 1987).

Jackson, Wall, Martin & Davids (1993) highlighted the lack of adequate instrumentation and developed the three demands constructs in the context of advanced manufacturing technology. *Monitoring demand* is conceptualised as the extent of passive monitoring required in the job, *problem-solving demand* reflects the more active, cognitive processing required to prevent or recover errors and *production responsibility demand* refers to the cost of errors in terms of both lost output and damage to expensive equipment. In the development of the measures they focused on job holders' perceptions of the variables, because psychological effects would be expected to depend on people being conscious of them. The above-mentioned constructs were used in the present study with several modifications in order to make them suitable for the nursing profession.

As described subsequently, three specific types of demands seem most clearly to be included in the demand – control theory: *time demands, monitoring demands* and *problem-solving demands* (Beehr *et al.*, 2001).

Task factors intrinsic to the job demands include the concept of workload as a potential source of stress. Extremes of workload are sometimes described as overload and underload and the impact of new technology on both these stressors has been emphasised (Sutherland & Cooper, 1988). In a national survey in the USA, Margolis, Kroes & Quinn (1974) found that *overload* was significantly related to a number of symptoms or indicators of stress -poor motivation, low self-esteem, absenteeism, escapist drinking and an absence of suggestion to employers. On the other hand, long periods of inactivity may be in the nature of the job, therefore job redesign would be necessary to alleviate the problem because "boredom" and "lack of challenge" were significant predictors of raised anxiety, depression and reported job satisfaction (Sutherland & Cooper, 1988).

Working activities are always productive in many ways. They may result in a positive outcome by successful completion of a given task and by allowing individuals to develop their skills and find satisfaction through them. On the other hand, if the outcome does not meet the standards indicated in the work assignment, the individual's state may worsen in performing the task. Meeting task demands is always strenuous and requires effort since demands are made on the abilities and on the eagerness to dedicate these abilities to the task. Although exposure to task demands is usually a negative process, it does not necessarily need to be regarded mainly as such (Meijman & Mulder, 1998).

As well as involving time pressure, a degree of effort in order to plan and think about the job, and concern to produce good quality work, workload may involve the subjective experience of stress which is indicated by increased anxiety, dissatisfaction,

depression and feelings of lack of control over the situation. Tattersall (2000) emphasised the need to consider both this subjective experience and the underlying cognitive processes between task demands, resources and effort, in order to understand the full extent of implications for the working lives of the individuals. The transactional nature of workload (Gopher & Donchin, 1986; Hockey, 1993) should also be taken into account. Poorer performance on a task may not indicate unavailability of human processing resources for maintaining the appropriate level of performance. It entails the possibility of lack of motivation on the individual's part to maintain such a high level of effort. This may result from a lack of awareness of the operating goals, inattention to increased demands or from an attempt to protect valuable resources in order to manage future events. Poor performance can also be due to illness or bad environmental conditions (Tattersall, 2000).

There is certainly evidence to suggest that workload has an effect on performance, well-being, health and safety. Differentiating between acute and chronic effects of managing the demands of work is important (Tattersall, 1994). Their two distinguishing features are associated with the timescale over which the effects are manifested and the different types of outcome. Acute effects are associated with direct effects of performance and are reflected in errors and slow response times due to poor task and job design. Chronic effects are manifested over a longer timescale and they have indirect effects on performance since the primary outcomes of these effects relate to aspects of individual well-being and health (Tattersall, 2000).

The focus of a different type of enquiry was on the effects of managing job demands over relatively lengthy periods of time. Having to actively manage the effort that is required in order to meet task demands may have various consequences for both short-term well-being and long-term health. High levels of workload have an effect on the physiological and emotional state of the individual and these changes may result in

reduced performance at work. Hockey (1993, 1997) stressed the role of regulatory processes in the transactions between individuals and working environments in the cognitive-energetical framework he developed. In conclusion, since the way in which individuals approach tasks varies, the effects and consequences of workload vary as well. The interaction between task demands, the strategies that the individual adopts in order to deal with the demands and the level of performance achieved determine the experience of workload (Tattersall, 2000).

Some individuals may deal with demands by adopting effortful strategies while others may put them off or suppress them, thus adopting a more passive style of coping (Hockey & Wiethoff, 1990; Tattersall, 2000). Therefore, measures of behavioural style or coping may be used to identify these differences between individuals. Hockey & Wiethoff (1990) found that fatigue was predicted by the level of work demands for junior doctors that were using an active coping style, whereas no such relationship was identified for the individuals adopting a passive coping style. The necessity of carrying out repeated measurements over a relatively long period of time using diary methods or multi-measurement techniques in order to fully assess the relationships between symptoms and work demands has been emphasised (Hockey, 1997; Tattersall, 2000).

Several researchers have reported significant associations between high demands and low job satisfaction (Cook & Rousseau, 1984; Healy & McKay, 2000). In addition, Parasuraman & Hansen (1987) reported more frequent job strain in situations of high load. In studying qualitative workload in nursing, Vredenburgh & Trinkaus (1983) recorded a significant positive association between complexity of patient conditions and job related tension.

More direct indices of ill-health have also been examined in relation to level of workload. Chronically high job demands have been found to be significantly associated with somatic symptoms, hypertension, gastric complaints and nervous trouble,

headaches and slight nervous disturbances, and physical and mental ill-health (Warr, 1987). Coronary heart disease has also been found to be more prevalent among high workload employees. In a Swedish national survey, Karasek *et al.* (1981) used a self-report index of signs and symptoms of CHD and reported a significant cross-sectional association with high job demands.

An interesting point concerning work tasks is that they differ in the degree of mental effort that has to be spent in the task performance. Consequently, Rasmussen (1987) classified them into three broad categories of processing levels: Skill-based, rule-based and knowledge-based. Tasks performed at the rule-based level involve the application of general rules and therefore do not require excessive mental effort. Tasks performed at the skill-based level involve the use of a long-term learning process and require minimal or no mental effort. On the contrary, the tasks performed at a knowledge-based level require a high amount of mental effort as they appeal strongly to the knowledge in the declarative memory and to the attention-demanding (controlled) processes in working memory. The variability of the work task in a specific situation usually determines the level of processing. Making an effort is very much a dynamic process, depending on the task load in combination with the operator's state and the amount of active control he has over the relationship between his performance and the effort to be expended (Meijman & Mulder, 1998).

It should not be assumed that the loads involved in daily work necessarily exceed a minimum level of harmfulness. However, their daily occurrence and consequently their function as a continued and uncontrollable source of tension, results is possible negative effects in the long run. Additionally, this is dependent on the opportunities for recovery between successive periods of exposure (Meijman & Mulder, 1998). In conclusion, the question of whether an increase in the duration and intensity of negative effects due to mental and emotional workloads may result in an increased

risk of psychosomatic complaints and illnesses can only be answered by a longitudinal study over a succession of years.

2.2.1 Regulatory control of demands

To account for repeated findings of minimal decrement of performance under high demand (Hockey, 1993, 1997; Kahneman, 1973), Hockey and his colleagues (Hockey, Briner, Tattersall & Wiethoff, 1989; Hockey, Wastell & Sauer, 1998) developed the *compensatory control* model. Essentially, the model postulates the operation of an adaptive regulatory process that facilitates the maintenance of the output for high priority task goals within acceptable limits, at the expense of low priority activities. The essential feature in the model is that the regulation of action is assumed to involve cost-benefit decisions about the use of effort in the service of performance goals (Hockey, 2000). Hockey (2000) identified three modes of demand management, *engagement, disengagement* and *strain* and maintained that these differ in the relationship between the use of direct or indirect control and the current level of demands. He asserted that these modes map closely to the patterns of adaptation to work environments identified by Frankenhaeuser (1986).

The engagement or direct coping mode of demand management maps onto Frankenhaeuser's category of "effort without distress" and is characterised by a high level of performance, high alertness and feelings of enthusiasm. The disengagement mode or passive mode of demand management corresponds to Frankenhaeuser's category of "distress without effort" and is characterised by reduced performance and increased anxiety and depression. Finally, the strain mode of demand management corresponds to Frankenhaeuser's category of "effort with distress" and is associated with an acceptable level of performance and high anxiety and fatigue (Hockey, 2000).

2.2.2 Dimensions of job demands in nursing

Work tasks are determined mainly by the goals of the organisation and are often embodied as the core elements of the job description. However, work environments do vary and some jobs are acknowledged as being very demanding (Hockey, 2000). Hockey (2000) distinguished between three broad kinds of demand that are based on the adaptive bio-cognitive systems that are challenged by work and environment events. Physical, cognitive and emotional demands reflect the essentially transactional nature of human response to stress (Lazarus & Folkman, 1984) and all three are strongly associated with the nursing profession.

Physical demands are associated with the necessity to work fast, expenditure of physical effort, and inconvenient hours. Although they are assumed to be absent from modern jobs, this is not always the case. Most jobs still involve some lifting and carrying (Hockey, 2000). By contrast, cognitive demands impinge primarily on the brain processes involved in information processing. The fact that the nature of tasks in many professions is becoming increasingly cognitively oriented is reflected in the emphasis on cognitive demands. Tasks involving cognitive processes that require memory, attention, decision-making and concentration for long periods are relevant here. Several researchers have pointed out the difficulty of estimating the demands of such tasks and predicting the consequences of such demands (Chmiel, 1998; Tattersall, 2000). Finally, emotional demands are strongly related to interpersonal systems. These demands are particularly relevant within the caring professions such as nursing and social work, as their emphasis in on goals that relate to the welfare of others. Emotional demands may also have an indirect effect on performance in cognitive tasks, because they compete strongly for the control of attention (Hockey, 2000; Oatley & Johnson-Laird, 1990; Taylor, 1991).

Nursing is acknowledged as an occupation that, unlike most other occupations, involves a heavy physical and cognitive workload. Furthermore, the fact that emotional demands are strongly related to the nursing profession is self-evident. Nurses' work tasks require attention, alertness, and concentration. Their work involves a significant amount of responsibility and caring for the welfare of patients. In addition, physical workload is associated with nursing, as nurses are required to do lifting and carrying. Heavy workload has been identified as a major source of stress for all nurses (de Jonge *et al.,* 2000). As previously mentioned, Söderfelt *et al.* (1997) have emphasised the need for inclusion of emotional demands in human service organisations. Research has also indicated that both role conflict and role ambiguity are inherent in the nursing role (Gray-Toft & Anderson, 1981). Role conflict and ambiguity frequently arise from opposing demands by the medical and administrative staff and from conflict between instrumental and expressive role functions (i.e. goal-oriented or "healing the patient" versus nurturant or "creating a therapeutic environment")(Hemingway & Smith, 1999).

2.3 Control

Variables of both a personal and cognitive nature and of a social/organisational nature have been hypothesised to influence the relationship between occupational stress and well-being (Beehr & Newman, 1978), leading to a large and diverse literature (Daniels & Guppy, 1994). One of these variables is *job control.* Ganster (1988) defined control as "the ability to exert some influence over one's environment, so that the environment becomes more rewarding or less threatening".

Researchers have been investigating the effects of perceived control over important outcomes for a long time (Rotter, 1966). While some theorists have suggested that there may be an intrinsic need to control the environment (White, 1959), others

(Rodin, Rennert & Solomon, 1980) have claimed that there is evidence suggestive of motivation for control, stemming from the belief that it ensures positive outcomes. In any case, rather powerful evidence exists linking control with a wide range of positive outcomes and lack of control with various forms of ill-health (Miller, 1979; Ganster, 1988; Perrewe & Ganster, 1989).

Psychologists generally are in agreement that controllability is a positive human experience and that losing control is a negative experience (Skinner, 1995; Steptoe & Appels, 1989). Having control is associated with reduction in uncertainty and an increase in predictability and freedom of choice. In the work setting, control enhances the employees' feeling and belief that "most situations that can occur in the near and distant future can be anticipated and dealt with" (Theorell, 1989: 49). Consequently, control has been regarded as a universal need (Bosma, Stansfeld & Marmot, 1998; Skinner, 1995).

Indeed, recent research findings have shown that job control may be the main crucial element in a healthy work environment (Bosma *et al.*, 1998; Bosma, Marmot, Hemingway, Nicholson, Brunner & Stansfeld, 1997; Johnson, Stewart, Hall, Fredlund & Theorell, 1996). Some form of the control construct has been investigated in different areas of organisational research including participation in decision –making (Locke & Schweiger, 1979), job redesign (Hackman & Oldham, 1976), goal-setting (Latham & Yukl, 1976) and machine pacing (Hurrell, 1981). The most explicit statement of the role of job control in occupational stress, however, is Karasek's (1979) job demand-job decision latitude model (Ganster, 1988).

2.3.1 Dimensions of control

The question of the dimensionality of the job control concept has only recently become of interest in the occupational stress literature (Jackson *et al.*, 1993). Some

basic theoretical frameworks regarded perceived control as a simple unidimensional construct. Individuals were assumed to evaluate personal control along a single global continuum, ranging from the absence of control to total control (Bryant, 1989; Langer, 1975; Rotter, 1966; Seligman, 1975). In addition, in many studies on job control, the concept has been conceptualised and measured as a single dimension, usually referred to as "decision latitude" (Karasek, 1979; Karasek & Theorell, 1990).

Recently, however, a multifaceted conceptualisation of control has been proposed by various researchers (Carayon & Zijlstra, 1999; Dwyer & Ganster, 1991; Jackson, Wall, Martin & Davids, 1993; Wall, Jackson & Mullarkey, 1995). Sainfort & Carayon (1991) examined 3 different levels of job control (instrumental control, conceptual control and decision control) in a group of computer users and reported that all 3 levels had different relationships with strain outcomes. Researchers at the Sheffield Institute of Work Psychology have attempted to define job control, by integrating the findings of the Job Characteristics Model (Hackman & Oldham, 1976) and Karasek's Demand – Control Model (Karasek, 1979) into a single framework. Research by Wall and colleagues (Wall, Clegg, Davies, Kemp & Mueller, 1987; Wall, Corbett, Martin, Clegg & Jackson, 1990b) has focused on three aspects of job control that were considered to be important in the context of advanced manufacturing technologies: *timing control, method control* and *boundary control* (Jones & Fletcher, 1996a). Wall and colleagues suggest that method control is similar to the approach to the concept of autonomy taken in the Job Characteristics Model (Hackman & Oldham, 1976). They have developed new measures of these dimensions (Jackson *et al.*, 1993) and have put forward a model that proposes that these three types of control are differentially related to well-being and performance (Wall, Corbett, Martin, Clegg & Jackson, 1990a). Wall and his colleagues tested a new questionnaire of timing and method control in a group of 1691 manufacturing employees, and demonstrated its validity and reliability

(Carayon & Zijlstra, 1999). Examination of the wider literature showed that the distinction between timing control and method control was not only significant to AMT and to associated forms of integrated manufacturing (Dean & Snell, 1991) but were also of much more general relevance (Breaugh, 1985; Jackson, Wall, Martin & Davids, 1993; Hollmann, Heuer & Schmidt, 2001). The above-mentioned types of job control have been used in the present study.

2.3.2 Conceptualisation of control

Terry & Jimmieson (1999) in their review of the research literature on worker control and well-being, have noted that there in consistent evidence that high levels of worker control are linked with low levels of stress-related outcomes such as anxiety, psychological distress, burnout, irritability and psychosomatic health complaints (Bond & Bunce, 2001). Discussions of control at work frequently assume that the concept is clear and unambiguous. However, in the literature, various viewpoints and perspectives on job control can be found. Levinson (1972) used the term of mastery, which is closely related to the concept of skill discretion of the job demands – control model (Karasek & Theorell, 1990). For some authors, job control is related to worker participation in the organisation, autonomy in the task or decision authority (Carayon & Zijlstra, 1999; Ganster & Fusilier, 1989; Karasek, 1979).

Even the major theories of job control contain controversial elements within their definitions. For example, the approach to job control adopted by Karasek's model is rather wider than the popular meaning of control, as it incorporates a measure of skill discretion and a measure of decision authority (Karasek, 1979). Karasek's (1979) suggestion that in future work it may be useful to distinguish between different aspects of control is still frequently ignored (Jones & Fletcher, 1996a).

Decision latitude has often been conceived as discretion (Spector, 1987), control (Sauter, 1989), autonomy (Aronsson, 1989) and self-determination (Kauppinen-Toropainen, Kandolin & Mutanen, 1983). A fundamental problem is that Karasek's (1985) original measure of decision latitude has been criticised as being a mix of job control, skill variety and job complexity (Frese, 1989; Ganster, 1989). However, these three dimensions are not the same thing (Kasl, 1996). However, a modification of the control construct in order to remove the dimensions of skill variety and job complexity, but including influences over a range of aspects of work, could still produce a fairly diffuse definition of control.

Several researchers attempted to overcome this danger by refining the concept of control, by discriminating between different types of control, and by looking at the relevance of the variables at specific work contexts. As previously mentioned, Wall *et al.* (1995) distinguished between boundary control, method control and timing control and developed specific measures applicable to a range of industrial jobs. In a recent study, Wall *et al.* (1996) used a more focused measure of control (timing and method control) and managed to demonstrate the interaction effect predicted by Karasek (1979). On the other hand, when in the same study they used Karasek's original measure of decision latitude they did not find an equivalent effect. Wall *et al.* (1996) point out that other studies finding significant interactions have used more focused measures than Karasek's concepts.

2.3.3 Effects of control

Frese (1989) suggested several possible causal pathways by which control might affect occupational stress. Direct and moderating effects of control may operate simultaneously. The direct effect is most clearly related to control over content of tasks, plans, feedback and conditions.

2.3.3.1 Direct effects of control. The most parsimonious model of how control might affect well-being is one that hypothesises a direct main effect of control on well-being. Consequently, control at work is seen as a force opposing to stress, positively associated with well-being. Conversely, low levels of control have been associated with increased levels of strain (Thompson, 1981), including negative outcomes such as depression (Elsass & Veiga, 1997; Seligman, 1975). Frese (1989) suggested that this main effect model is based on a need for control which if not fulfilled will result in negative outcomes (Kelloway & Barling, 1994). On the other hand, Ganster (1988) claimed that the above hypothesis essentially represents the *intrinsic motivation for control* theory (White, 1959), stating that personal control over events enhances the individual's sense of personal competence and self-esteem. Certainly, there is a wealth of empirical data suggesting that autonomy, a construct related to control, is associated with measures of affective well-being such as job satisfaction (Elsass & Veiga, 1997; Kelloway & Barling, 1991).

2.3.3.2 Indirect effects of control. According to this hypothesis, control at work may be used to decrease the occurrence or intensity of job demands and thereby to enhance well-being. In this view control does not lead directly to strain, but rather indirectly through its effects on experienced job demands. This hypothesis is also consistent with the person-environment fit model of job stress (Caplan, Cobb, French, Harrison & Pinneau, 1975). In this model, job demands are hypothesised to be strain-inducing when there is a misfit between the actual level of the demand and the level desired by the worker. Control allows the worker to improve person – environment fit and would therefore decrease strain (Ganster, 1988).

Unfortunately, there is not much evidence that directly addresses the above hypothesis. Caplan *et al.* (1975) presented evidence suggesting that more control leads

to adjustments to job demands. However, Ganster (1988) has argued that while such data do suggest an indirect effect of control, making causal inferences is questionable. In addition, Jackson's (1983) field experiment reported data that were suggestive of an indirect effect of job control on strain through job demands. However, as there are not sufficient data on job demands, the evidence for an indirect effect rather than for a direct effect on emotional strain is not very convincing.

2.3.3.3 Moderating effects of control. According to the interactive hypothesis (Karasek, 1979) perceptions of decision latitude moderate the impact of job demands on individual well-being. This suggests a buffering process of control over the demands of the job. Control would, therefore, play a major role in either allowing individuals to limit their exposure to stressors or in enabling them to select among a variety of stressors in the workplace. Individuals with control may be able to choose their tasks, or they may be able to limit the most stressful tasks (Elsass & Veiga, 1997).

The focus of much research has shifted and attempts were made in order to confirm the existence of the hypothesised interactive effect. As has been pointed out by several researchers (Karasek, 1979; Parkes, 1991), the above hypothesis is of practical as well as theoretical interest. If the effect is interactive – and demands are harmful primarily in conditions of low control – strain could, in practice, be reduced by increasing control without reducing workload. In the case of additive effects this strategy would not be as effective (Jones & Fletcher, 1996a). The demand – control model (Karasek, 1979), which includes the most explicit statement of an interactive effect, proposes that when job demands exceed the control possibilities of the worker, this would result in psychological strain (Karasek & Theorell, 1990). However, although there is a bulk of evidence indicating that both control and demands affect

psychological strain, there is relatively little evidence indicating an interactive effect (Kelloway & Barling, 1994; Teuchmann, Totterdell & Parker, 1999).

In an attempt to explain the relatively weak evidence supporting a moderating effect of job control, Frese (1989) points out that this may be due to the fact that the moderator effect may be more complicated than was originally assumed. Most researchers implicitly or explicitly assume a moderator effect of the "switch-on, switch-off" kind, hypothesising that in the absence of control stressors will have an impact on health whereas in the presence of control stressors will have no impact. However, the nature of the moderator effect may be more complex, depending on the time course of the stressors affecting ill health. Frese & Zapf (1988) have distinguished 6 different models of how stressors can affect ill health. The above could be one of the reasons for the failure to produce significant results on the moderating effect of control. Other reasons include conceptual unclarity, measurement of only parts of the concept and power problems in moderator analyses (Frese, 1989).

2.3.4 Self-report studies of job control

Spector (1986) provides a general overview of studies of perceived control by conducting a meta-analysis of 88 studies on autonomy and participation at work, involving 102 samples (Parkes, 1989). He reported that high levels of perceived control were associated with high levels of job satisfaction, commitment, involvement, performance and motivation, and low levels of somatic symptoms, emotional distress, role stress, absenteeism and turnover. It should be noted, however, that the data analysed by Spector do not allow causal interpretation. Yet, results from longitudinal studies indicate that an increase in autonomy as a result or organisational change or promotion, leads to an increase in affective well-being, confidence and job satisfaction (Kirjonen & Hanninen, 1986; Mortimer & Lorence, 1979; Wall & Clegg, 1981).

Several studies have also examined perceived control in relation to self-reports of physical outcomes. Karasek, Gardell & Lindell (1987) found that higher levels of perceived control at work were associated with fewer physical symptoms and with less use of medication, however their method of analysis did not allow tests of demand-control interactions. However, in a longitudinal study, Bromet, Dew, Parkinson & Schulberg (1988) found significant interactive effects of job decision latitude and job demands on alcohol problems and symptom levels (Parkes, 1989).

In conclusion, control has been a major element in theories of occupational stress and in other areas of organisational research. It has been hypothesised to be the potential cause of both physical health and psychological well-being (Ganster & Fusilier, 1989). Additionally, a moderating effect of control has been hypothesised in the demand-control model (Karasek, 1979). Although the relation of control to health and well-being has been firmly established (Spector, 1986), the moderating effect of control has not been supported consistently. Finally, most of the literature on occupational stress failed to illustrate the exact mechanisms by which control affects health (Spector, 1998).

2.4 Social support

The identification of factors that reduce or eliminate the adverse effects of occupational stress has been of main interest to researchers (Ganster, Mayes, Sime & Tharp, 1982). The degree of *social support* that an individual receives has been regarded as the primary social factor to alleviate these negative effects.

The importance of integration within a socially cohesive group for mental and physical health is widely acknowledged. Conversely, the absence or disruption of fulfilling social ties has been associated with negative effects upon well-being and mental health (Marcelissen, Winnubst, Buunk & De Wolff, 1988). Since the Hawthorne

experiments in the 1920s, it became apparent that social relations between co-workers and supervisors influence productivity through "norms of fair performance", as Homans described them in 1950. Furthermore, cohesiveness in a work group could protect the workers from any unreasonable pressures from the management. In many U.S studies supervisor support was found to be the most significant correlate of job satisfaction and low psychological strain.

Social support may be considered to be a flow of communication between people involving emotional concern, caring, information, as well as instrumental help (Ganster, Fusilier & Mayes, 1986).

2.4.1 Typology of social support

House (1981) distinguished between emotional, appraisal, informational and instrumental support. Emotional support includes affective participation, empathy, liking, or respect. Appraisal support involves the provision of information that is relevant to self-evaluation, can be expressed through the shared opinions. Informational support involves offering information that is necessary for completing a task, and instrumental support may include numerous types of direct help (Dormann & Zapf, 1999).

Karasek & Theorell (1990) identified two types of social support in the workplace. Socioemotional support is the degree of social and emotional integration and trust between so-workers and supervisors and is considered to be a buffer against psychological strain. Instrumental social support includes additional resources or assistance provided by co-workers or supervisors for the completion of work tasks.

Perceived social support has emerged as a prominent concept that describes social support as the cognitive appraisal of being reliably connected to others. It is highly consistent with the assumption that social support is information (Cobb, 1976)

and the highlighted feedback function of social support (Cassel, 1976). The concept also fits cognitive models of stress and coping processes (Folkman, Schaefer & Lazarus, 1979; Lazarus & Launier, 1978) that emphasize the appraisal of potentially threatening situations and resources that can be enlisted in coping efforts (Barrera, 1986).

In conclusion, the multidimensionality of social support is widely acknowledged (Dean & Lin, 1977; House, 1981). The above highlights the significance of not only the amount of support received, but also of the types of support (socioemotional and instrumental) and the sources of support (spouse, kin, co-workers). Some evidence exists indicating that not all sources or types of support are equally effective in reducing distress (Eaton, 1978; House, 1981; Thoits, 1982).

2.4.2 Effects of social support

Social support has been hypothesised to have a diversity of connections to stress, distress and intervening processes (Brenner, Sorbom & Wallius, 1985; Gottlieb, 1983; House, 1981). Most of the studies have investigated one of the following hypotheses (Cohen & Wills, 1985; Dormann & Zapf, 1999):

According to the direct (main) effect hypothesis social support has a direct positive impact on health. Individuals who experience direct emotional help will show less symptoms of mental or physical health (Fisher, 1985; Turner, 1981). Two types of direct effects can be distinguished (Marcelissen *et al.*, 1988): First, support provided by co-workers and supervisors may directly reduce certain work stressors. This coincides with the view that social support may structure the work role itself (Ganster, Fusilier & Mayes, 1986). According to the second type of direct effect of support social support may have a direct positive effect on physical and mental health by meeting important human needs for affection, belonging and understanding.

The indirect (mediating) effect hypothesis states that social support exerts an indirect effect on adjustment and health by directly reducing perceived and actual stress, which in turn leads to well-being (Digman & West, 1988; Dormann & Zapf, 1999). In this case support has a stress-preventive effect (Barrera, 1986). However, this hypothesis has received little attention.

The moderating (interaction) effect, also known as the buffering hypothesis states that social support acts as a buffer and prevents stressors from developing their impact on strains (Aneshensel & Frerichs, 1982; Cohen & Wills, 1985; Dormann & Zapf, 1999; Marcelissen *et al.*, 1988; Thoits, 1982). Theoretically, social support is expected to moderate the relationship between stress and negative outcomes by "facilitating efforts at coping and defence" when stress is high (House, 1981:39). The presence or absence of such an effect has important implications for the intentional provision of support. In the absence of a moderating effect social support is equally helpful at all levels of stress and if main effects permit it, it should be provided at all levels. However, in the presence of interactive effects, provision of support is significant only under very high levels of stress (Fisher, 1985).

The moderating effect has been mostly investigated, mainly due to the practical implications associated with it. When a buffering effect operates, social support has a positive effect upon well-being and health, even when a high level of stressors exists. Because the reduction of stressors may sometimes not be possible, the negative effect of high stressors can be compensated for by increasing social support.

There is an overwhelming collection of studies investigating the relationship of social support to physical illness and psychological disorder (Broandbend, Kaplan, James, Wagner, Schoenbach, Grimson, Heyden, Tibblin & Gehlbach, 1983; Kessler, Price & Wortman, 1985; Mitchell, Billings & Moos, 1982). A wide range of problems

has been studied, including depression, cancer, birth complications, psychological distress, job dissatisfaction, child maltreatment and numerous others (Barrera, 1986).

Findings regarding the buffering hypothesis have been inconsistent. Several studies did report evidence of a moderating mechanism (LaRocco, House & French, 1980; Karasek, Triantis & Chaudhry, 1982; Kobasa & Puccetti, 1983), while others found no evidence in favour of a moderating mechanism (Ganster *et al.*, 1986; Ganellen & Blaney, 1984; Kaufman & Beehr, 1986; Norbeck, 1985).

Focusing specifically on the buffering hypothesis, several criticisms and potential explanations have been put forward in an attempt to account for the inconsistent findings. Vaux (1988) observed the difficulty in comparing results produced from different studies since each study employs diverse conceptualizations of social support, stress and strains (Unsal, 1994). Moreover, methodological weaknesses that characterize studies of social support, as was previously mentioned, do affect the findings on the buffering hypothesis as well. For instance, evidence for a buffering effect may come from studies based on small samples (Schaefer, Coyne & Lazarus, 1981).

Although there is general acceptance of the beneficial effects of social support on health, adjustment and well-being (Broadhead *et al.*, 1983; Leavy, 1983) issues pertaining to whom individuals are willing to ask for assistance and what types of assistance they seek, should be studied further (Gottlieb, 1983; Heller & Swindle, 1983; Mitchell *et al.*, 1982). Both personality characteristics and the individual's developmental level may have an effect on these choices (Caldwell & Reinhart, 1988).

It is evident that the exact role of social support in the alleviation of stress has not been completely understood. The main reason for this is the fact that the vast majority of the studies on job stress and social support have been cross-sectional, therefore not allowing causal interpretations to be made. Concurrent correlations

between measures of social support and stressors are open to alternative explanations. They may indicate that social support reduces or prevents job stress or that job stress has a negative effect on the level of social support. Alternatively, a third factor such as a personality characteristic may influence both social support and well-being (Cohen & Wills, 1985; Marcelissen *et al.*, 1988).

CHAPTER 3

LONGITUDINAL AND DIARY APPROACHES TO OCCUPATIONAL STRESS RESEARCH

3.1 Introduction

The majority of research in occupational stress is of a cross-sectional nature. The fact that all the variables are studied at only one point in time in cross-sectional designs makes them susceptible in alternative explanations regarding the direction of causality and therefore results in several rather severe impediments to establish cause – effect relationships (Kasl, 1986). An equally significant explanation is that both the stressors and the outcome variables are affected by some third variable which accounts for the observed association between them and which makes the association spurious (Link & Shrout, 1992). The consequences of these limitations are such that the data may reveal an association (or fail to do so) irrespective of the true nature of the aetiologic process under study (Contrada & Krantz, 1987).

Consequently, several researchers recommended the use of a longitudinal design for the reduction of problems that have been linked with cross-sectional studies (Frese & Zapf, 1988; Zapf, Dormann & Frese, 1996). Longitudinal studies can be useful in studying the time dependency between independent variables and the dependent variables, therefore improving confidence regarding the causality of these relationships (Carayon & Zijlstra, 1999). Longitudinal methodology involves the investigation and identification of intraindividual change by observing the same individual repeatedly. Change, constancy and process extend through time, therefore static observations do not provide the necessary information for studying the phenomena of interest (Nesselroade & Baltes, 1979). Longitudinal data can help us if the change between waves of data

collection could be used to provide insight into the causal dynamics of the association between various stressors and health (Kessler, 1987). A detailed discussion on longitudinal research follows in section 3.2. There are other reasons for emphasising the analysis of stress in process terms.

In the assessment of daily events, if the focus is on phenomena that can change rather than on variables that are stable characteristics of the individuals, the findings on the effects of these daily events will have practical value. Findings regarding phenomena that are less stable would be more useful in terms of treatment implications, as they would be easier to change (DeLongis, Hemphill & Lehman, 1992). A second reason for examining stress in process terms is the requirement to reflect current theories on stress, coping and social support (Lazarus & Folkman, 1984) which have been largely articulated in process terms. The causes and effects of stress are thought to occur over time and the immediate effects may not reflect the ones occurring weeks or months later. Therefore, if the study of phenomena involves a single or a few assessments, it is likely to miss significant elements of the unfolding of events over time and to draw inaccurate or incomplete conclusions (DeLongis *et al.*, 1992).

The notion that cognitions and behaviours will be better understood if they are viewed as part of ongoing interactions with the environment rather than as static events, requires a methodology involving the study of individuals over time (Lazarus, 1990; Lazarus & DeLongis, 1983). Repeated assessments of an individual over time facilitate within-subject analyses, thus allowing questions about process to be more fully addressed. In addition, these repeated assessments permit comparisons of cognitions and behaviours under different circumstances, and therefore offer some control over potential confounds or stable characteristics of the individuals that may account for relations between daily events and outcomes (Dohrenwend & Shrout, 1985; Lazarus, DeLongis, Folkman & Gruen 1985).

Examination of stress in process terms may involve the use of a diary methodology, as it facilitates the assessment of daily experiences. This is significant due to the growing interest in the stress and coping field on how stress affects everyday life. Additionally, several studies (DeLongis, Coyne, Dakof, Folkman & Lazarus, 1982; DeLongis, Folkman & Lazarus, 1988; Eckenrode, 1984; Kanner, Coyne, Schaefer & Lazarus, 1981; Monroe, 1983; Stone & Neale, 1984) have demonstrated that it is the common everyday stressful events (microstressors) rather than major life-events that have a cumulative and notable effect on psychological and physical well-being. Minor stressors are a recurring characteristic of daily life. For this reason it is difficult to establish that they lead to the onset of physical and psychological dysfunctioning. Frequently, all that is established in traditional nonexperimental research is that there is a link between enduring daily stress and poor mental health. However, such associations do not eliminate the possibility of reverse causation or spuriousness due to third variables. A significant advance in the study of minor stress had been the use of daily diaries. The diary methodology is considered further in section 3.3.

The diary data offer the potential of using Epstein's hybrid methodology, which combines idiographic and nomothetic approaches (Allport, 1937), thus providing highly reliable data.

The *nomothetic* and *idiographic* approaches to stress and personality research (Allport, 1937) both emphasise the importance of thorough and systematic investigation, though in different ways. The nomothetic approach involves the identification of general laws about human behaviour. Consequently, nomothetic research uses statistical methods that would allow for and average out human variation. Researchers engaged in nomothetic research are in search of general differences between groups rather than individual idiosyncrasies. In this way, it allows generalisations to be made over individuals (Epstein, 1980, 1982, 1983; Tennen &

Affleck, 1996). In contrast, idiographic research, the in-depth and broad investigation of an individual over a sample of situations, involves exploring uniqueness- what makes a person distinctively individual. This approach allows for generalisations to be made over situations and occasions (Hayes, 2000). Each procedure has its advantages and limitations, and neither is a substitute for the other.

Idiographic and nomothetic procedures can be used in a supplementary manner, thus combining the advantages of each separate procedure. This involves the examination of a group of individuals on several occasions with several measures (e.g. Murray, 1938; Epstein, 1977, 1979, 1983). The virtues of a combined idiographic-nomothetic approach were first advanced by Epstein (1983) and such an approach has been advocated by several researchers (Larsen & Kasimatis, 1991; Lazarus & Launier, 1978; Tennen & Affleck, 1996).

First, the combination of nomothetic and idiographic procedures offers an increase in the reliability and generality of the findings, as they average over many situations and occasions rather than examining individuals in specific situations on single occasions (Epstein, 1980). The combined approach contributes to the stability of each person's personality profile and this can be examined as a variable in its own right. As the data are collapsed over occasions and situations, they can offer very strong measures of broad behavioural dispositions that can be related to other variables in a nomothetic design (Epstein, 1983).

Epstein (1986) emphasised the value of aggregation in increasing the predictability of behaviour. He proposed that although mainly situational factors determine behaviour, yet there is a small element of generality. The compounding of this small general component through aggregation would allow the detection of broad cross-situational dispositions, or traits and of relationships between behavioural and other measures of personality. Epstein (1977, 1979) suggested that single items of

behaviour, irrespective of how objectively they have been measured, would probably be low in reliability and have a too narrow level of generality to produce high correlations with other items or with measures of traits. Consequently, they would not be capable of demonstrating stability in behaviour. Behaviour that is observed on a single occasion is likely to be situationally unique and therefore inadequate in establishing reliable generalisations that would hold over even the most minor variations in the situation. In addition, he argued that the concept of trait refers to a broad, stable disposition to respond with a class of behaviours and therefore should not be measured by single behavioural acts and should not be expected to predict single behavioural acts with a high degree of accuracy (Epstein, 1986).

Consequently, Epstein (1979) hypothesised that stability can be demonstrated over a wide range of variables provided that the particular behaviour is averaged over an adequate number of occurrences. He points out that the necessity to aggregate behaviour over situations in order to obtain replicable findings at a meaningful level of generalisation stems from the very fact that behaviour is often so highly situationally specific. However, the fact that situations often exert a strong influence on behaviour is not incompatible with the acceptance of the existence of relatively broad, stable response dispositions since individuals do not manifest response dispositions independent of the setting (Epstein, 1979).

The emphasis on the highly situational specificity of human behaviour implies a considerable influence of incidental factors of no obvious theoretical interest, which either cannot be controlled, or, if controlled, could produce generalisations of such a narrow scope that could not be scientifically useful. The valuable contribution of aggregation over situations or occasions is lies in the removal of the influence of those incidental, uncontrollable variables.

The stability and cross-situational generality of behaviour and the existence of stable dispositions was verified in a series of studies conducted by Epstein (1977, 1979, 1980, 1983). The studies demonstrated adequate temporal reliability and evidence for validity in the form of statistically significant relationships among the variables, when the data were aggregated. Numerous researchers have confirmed the above (Cheek, 1982; Eaton, 1978; Moskowitz, 1982).

In summary, the value of aggregation lies in demonstrating stability and cross-situational generality of behaviour. Aggregated data reduce error of measurement by cancelling out the effects of uniqueness of individual subjects. In addition, aggregation increases temporal reliability, replicability and validity of the data. Consequently, aggregation is a powerful technique and an excellent procedure for establishing replicable generalisations.

Diary data offer rich analytic potential. In some cases, researchers use diaries as a way to obtain the above-mentioned aggregate measures about some characteristic of participants that can be used as part of a cross-sectional analysis (Campbell, Chew & Scratchley 1991) or as a baseline assessment in a two-wave panel analysis (Wong & Csikszentmihalyi (1991). An alternative use of the diary design is to generate information about disaggregated person-time observations that are treated as the unit of analysis has been used by other researchers. Research by Larsen & Kasimatis (1991) and Bolger & Schilling (1991), Caspi, Bolger & Eckenrode (1987), Jones & Fletcher (1996b) are examples of research using disaggregated time-series analysis. The diary design is conceptualised as a single –stage cluster design of I (individuals) clusters of size N (occasions), where $I \times N = n$ measurements. For example, 100 persons x 30 diary days generates 3000 person-day observations (Stone, Kessler, & Haythornthwaite, 1991).

It is essential to note that the focus in the present research is not to examine day-to-day causal effects with the pooled analysis. Instead, it takes advantage of the analytic potential of diary data in order to conduct powerful pooled within-person analyses of *same-day* relationships based on day-to-day variation for both the independent and dependent variables. This procedure is rarely used within the demand – control framework but it is a novel way by which we are aiming to accomplish a systematic examination of the model. Uncommonly strong conclusions can be drawn when the sequencing of variables is analysed within persons over time (Affleck, Tennen, Urrows & Higgins, 1994).

3.2 Longitudinal studies

It has become increasingly apparent that the question of how stressor-strain relationships unfold in time is vital in stress research. Nevertheless, few studies systematically addressing this question have been carried out (Garst, Frese & Molenaar, 2000). In addition, the duration of the stressor may be a critical factor in determining its outcome (Beehr & Newman, 1978; Payne, Jick & Burke, 1982). For example, Keenan & Newton (1985) suggest that anger may be the most common response to an acute stressor whereas anxiety may be the most common response to a chronic stressor. Also, chronic stressors may be associated with more negative and costly effects than acute stressors (Fleming, Baum & Singer, 1984; Pratt & Barling, 1988). Frese & Zapf (1988) have put forward a series of theoretical models in order to provide explanations for the numerous ways in which the experience of stressors may bring about psychological and psychosomatic dysfunctioning over a period of time (Garst, Frese & Molenaar, 2000).

A number of researchers have stressed the importance of using a *longitudinal* framework in order to fully understand stress and its consequences (Barling & Rosenbaum, 1986; Cooper & Marshall, 1976; Payne *et al.*, 1982, Schuler, 1980; Stone

& Neale, 1984). Although the findings that effects of stressors that are not found cross-sectionally will still be displayed longitudinally call for further investigation, longitudinal investigations of the stress – outcome relationships are infrequent (Beehr & Newman, 1978; Pratt & Barling, 1988).

The majority of stress research has been *cross-sectional.* Cross-sectional or "conspective" studies are "psycho-or socio- static", and provide a simultaneous and synoptic study of the situation as it is at the time of the enquiry (Wall & Williams, 1970). Cross-sectional designs in which data are collected at a single time point were originally conceived as a practical and appropriate means to study longitudinal change. However, in order for the cross-sectional method to generate valid information about within individual development, there are many assumptions to be met (Nesselroade & Baltes, 1979).

There are several methodological problems associated with the use of cross-sectional research: First, it does not provide a firm basis for drawing causal inferences. More specifically, it has been argued (Sargent & Terry, 1998) that cross-sectional designs are likely to inflate the observed correlations between predictors and outcomes due to method variance, which is contributed to by response consistency effects. Both stable dispositional factors such as negative affectivity, and unstable occasion factors such as mood (Spector, 1992; Spector & Brannick, 1995; Teuchmann *et al.*, 1999; Zapf *et al.*, 1996) are responsible for the origination of these effects. Because occasion factors are unstable, a reduction of their effects would be possible by the assessment of the predictors and the outcomes at different points of time. An additional deficiency of cross-sectional studies is that they are based on differences between people at a specific time, rather than focusing on changes within people over time. Therefore, the presence of third variables (such as personality variables) that may account for the association between variables cannot be ruled out (Teuchmann *et al.*, 1999).

The limitations of cross-sectional studies as evidenced by the insensitivity of cross-sectional data to the dynamics of growth and change and the findings of considerable differences between the results of cross-sectional and longitudinal studies have been the driving force for the use of longitudinal designs in research (Nesselroade & Baltes, 1979).

Longitudinal or prospective studies are "socio- or psycho- dynamic" and are interested in change (Wall & Williams, 1970). They involve research that allows the repeated observation of different kinds of variables, such as psychological and physical variables, within a single group of subjects over a period of time (Kobasa, 1985).

The great appeal of longitudinal research lies in the fact that it is a tool for the understanding of change and process. The aim of longitudinal methodology is the study of phenomena in their time-related constancy and change (Nesselroade & Baltes, 1979). As Kasl (1983) effectively argues in a recent review of stress and illness research, the confusion and inconsistency resulted mostly from to stress researchers' failure to take advantage of prospective longitudinal studies.

The contribution of longitudinal research can be summarised in two main points: Primarily, it facilitates the identification of both the stability and variation in the psychological characteristics of individuals over a period of time. In addition, it assists in the identification of the interplay between the individual (psychological and biological) and environmental (physical, social and cultural) influences during development (Kobasa, 1985).

Zapf *et al.* (1996) stressed the need to employ longitudinal designs for two main reasons: The first reason pertains to their superiority for testing causal hypotheses. Especially in research designs where proposed causes precede proposed effects, longitudinal data can facilitate the detection of the direction of causation (Cox, 1992). Furthermore, longitudinal data enable one to assess changes in the independent

variables in relation to changes in the dependent variables (Frese & Zapf, 1988; Spector, 1994). Finally, a longitudinal design may allow the examination of reverse and reciprocal causation between independent and dependent variables (Moyle, 1998; Tharenou, 1993; Williams & Podsakoff, 1989). The second reason for employing a longitudinal design is that it assists in the rejection of third variable explanations. However, it should be pointed out that the treatment of third variables in longitudinal designs has not been adequate. Although in cross-sectional studies there is awareness of the problem, researchers do not typically include them as control factors in longitudinal research, so their effects may be ruled out (Link & Shrout, 1992). The above point will be discussed further below.

3.2.1 Methodological criteria for Longitudinal studies

The belief of many researchers that the application of a longitudinal design will automatically solve many of the problems associated with cross-sectional studies, has led to lack of common standard procedures for analysing longitudinal data (Williams & Podsakoff, 1989). The following recommendations can be made with regard to methodological issues of longitudinal stress research (Zapf *et al.*, 1996):

(1) All variables should be measured at all time points with the use of the same measurement method for the particular variables. This should be done in order to explain reverse or reciprocal causation hypotheses and certain third variable hypotheses such as occasion factors.

(2) Third variables have been seen as potential confounders of the stressor-strain relationship. It has generally been acknowledged that correlations between predictors and outcomes could be inflated by spurious covariation with third variables such as occasion factors and personality factors. Their inclusion in the design in order to control for their effects and establish causality is vital. With reference to this point it has been

proposed to control for the effects of prior adjustment in the prediction of subsequent adjustment, in order to restrict the potential biasing effects of both occasion and dispositional factors (Kelloway & Barling, 1994).

(3) The time lag should be carefully considered and designed (Kessler, 1987). As demonstrated in simulation studies, a very short time lag may prove to be more problematic than a very long time lag as it may lead to the conclusion that there is no causal effect. A very long time lag, on the other hand, may result in just an underestimation of the true causal effect (Dwyer, 1983).

(4) Assumptions about how a stressor may affect ill-health in the course of time should also be taken into consideration when deciding the time lags between the measurement points. The *initial impact* model of stress effects implies that the longer the impact of the stressor on the individual, the higher should the incidence of ill-health be and this would require measurement points that are at most a few months apart. On the other hand, the *exposure time* model implies a longer period between the onset of stressors and the appearance of their effects and therefore requires time lags of one or two years apart (Frese & Zapf, 1988; Zapf *et al.*, 1996). Moreover, exposure time is not the only factor but exposure intensity is very important as well. Campbell, Daft & Hulin (1982) have identified the establishment of proper time lags in longitudinal studies as one of the most problematic issues in organisational research. Kelloway & Barling (1994) have stressed the need for researchers to begin specifying appropriate time lags for hypothesised effects. Furthermore, it has been suggested (Barnett & Brennan, 1997) that having only two data points seriously constraints the analysis of change. In conclusion, Zapf *et al.* (1996) have recommended a multi-wave design with equal time lags between each wave as the most appropriate *longitudinal* design.

(5) Finally, due to the cross-sectional nature of the majority of the studies on occupational stress, the time factor was never considered. However, the necessity of a

detailed conceptualisation of the time component in research on occupational stress has been emphasised (Frese & Zapf, 1988). In line with this, it is advisable to make assumptions about the time course of the study variables (Zapf *et al.*, 1996). If the researchers anticipate that adaptation may set in, they should investigate the subjects at the beginning of their jobs, in order to avoid adaptation to their working conditions.

The cost, the likelihood of attrition and the administrative problems linked with longitudinal studies should be taken into consideration in order to determine its duration and design (Wall & Williams, 1970). The cooperativeness and accessibility of the participants of a longitudinal study should also be considered. Maintaining contact and sustaining the motivation of the participants is difficult and costly and requires considerable administrative resources (Wall & Williams, 1970).

In conclusion, longitudinal designs require a great deal of research time and effort. It is crucial to acknowledge that longitudinal studies do not offer uncomplicated and final solutions to research questions but their importance lies in the fact that they emphasise the significance of theory for the selection of research strategies. This is due to their requirement for theoretical models that are both highly structured and detailed and specific and due to the fact that they generate new research questions. Consequently, they make a unique contribution to the development of any discipline (Kobasa, 1985).

Nonetheless, it is worth noting that single longitudinal studies, although of great value in themselves, would be more powerful and their conclusions would be generalisable if they were combined with cross-sectional surveys.

3.2.2 The job Demand – Control model and Longitudinal studies

Our knowledge of the cumulative or long-term effects of specific job conditions on mental health is very limited, due the fact that the majority of studies examining the

stress-illness relationship are of a cross-sectional nature. Therefore, the assessment of the effects of chronic exposure to demands that is a fundamental principle of the job strain (demand – control) model has not been possible (Barnett & Brennan, 1997).

As already discussed in Chapter 1, the "demand – control model" hypothesis that jobs that are low in control are linked with psychological distress, has been demonstrated cross-sectionally (Baker, 1985; Ganster, 1988, 1989; Hackman & Lawler, 1971; Jackson, 1989; Karasek, 1989, 1990; Karasek & Theorell, 1990).

The examination of the demand – control model over a period of time is restricted as a large part of the research on the model relies on cross-sectional data. Thus the reliability of the results cannot be examined and the issue of the direction of causation is not resolved. Frese (1985) used cross-lagged correlation analysis to examine the causal direction between a global measure of job stressors and a measure of psychosomatic complaints. Studies similar to Frese (1985) need to be performed to examine Karasek's model (Carayon, 1993).

3.2.3 Review of Longitudinal studies

A systematic search of the PsycInfo database was performed in order to locate longitudinal studies of the demand – control model. In addition, the reference lists of relevant publications were screened for additional empirical studies. The studies were published between 1979 and 2002, employed a longitudinal design and tested the demand – control model.

Eighteen longitudinal studies that tested the model were found. Tables 3.1, 3.2 and 3.3 present the 18 studies in chronological order, beginning from the earliest to the latest. The tables include the population in which the demand – control model was tested, the number of individuals (n) tested in each study, the number of waves and the time lag. Information about inclusion of third variables in the design is also presented

and the third variables are specified. Furthermore, the outcome measures (dependent variables) used in each study and the data analytic procedure are presented. In addition, the table includes information about the main effects and the interaction effect. A "+" under the "main effect of demands" title indicates that as job demands increase the outcome measure increases. A "0" indicates that no main effect of demands on the outcome measure was found. An "x" indicates that the main effect of job demands on the outcome measure was not tested. A "-" under the "main effect of resources" title indicates that as job control and social support increase the outcome measure decreases. A "0" indicates that there is no main effect of resources on the outcome measure and an "x" indicates that the main effect of resources on the outcome measure was not tested. The buffering effect of the demand – control model predicts that the normal impairment in mental health induced by high work demands is attenuated by high levels of resources (i.e. there is a negative interaction). Accordingly, under the "interaction effect" column, the convention adopted is to use a "-" to indicate that a high level of resources reduces the negative effect of demands. A "+" indicates the opposite: that high resources further increase the effect of demands (positive interaction). Again, a "0" under this column indicates that no interactive effect was found and an "x" indicates that the interactive effect was not tested.

STUDY	*POPULATION*	*n*	*No. of waves*	*Time lag*	*Third variables*	*Outcome measures*	*Data analysis*	*Main effect (D)*	*Main effect (R)*	*Interaction effect (D x R)*	*Remarks*
Karasek, 1979	Various occupational groups	1896	2	6 yrs	age	depression, exhaustion	ModLR	+	–	–	
Karasek et al., 1981	-Various occupational groups	1461	2	5.7 yrs	overweight, smoking (self-reported)	coronary heart disease	ModLR	+	–	×	
	- Subsample	88						+	×	–	
Theorell et al., 1988	Various occupations	73	4	not mentioned	age, sleep disturbance, depressive tendency	cortisol, prolactin, blood pressure	ModLR	+	×	0	
Bromet et al., 1988	Power plant employees	325	2	1 yr	age	affective disorder, symptomatology	ModLR LogR	0	0	0	*Social support as predictor*
Parkes, 1991	University graduates	147	2	2 - 5.6 mths	age	anxiety, social dysfunction	ModLR	+	0	–	*Social support as predictor*
Muntaner et al., 1991	Community sample	11789	2	1 yr	age, marital status, educational level, gender	schizophrenia, psychotic affective syndrome	LogR	+	–	×	

Table 3.1: Longitudinal studies of the demand – control model – **D**: demands, **R**: resources, + (main effect): increase in strain, – (main effect): decrease in strain, + (interaction): positive interaction [see text], – (interaction): negative interaction [see text], 0: no effect, ×: not tested, **ModLR**: moderated linear regression, **LogR**: logistic regression, **yrs**: years, **mths**: months

STUDY	*POPULATION*	*n*	*No. of waves*	*Time lag*	*Third variables*	*Outcome measures*	*Data analysis*	*Main effect (D)*	*Main effect (R)*	*Interaction effect (D x R)*	*Remarks*
Kawakami et al., 1992	Blue collar factory workers	468	4	1 yr	age, marital status, educational level, Type A	depressive symptoms	BinR	+	–	0	
Carayon, 1993	Office workers	122	2	1 yr	age, gender, marital status, tenure, educational level	tension-anxiety, depression, daily life stress	ModLR	+	–	0	
Parkes et al., 1994	Student teachers	180	2	2 mths	age	somatic symptoms	ModLR	+	0	–	
Daniels & Guppy, 1994	Accountants	244	2	1 yr	not included	psychological distress	ModLR	+	–	–	*Social support and locus of control as predictors*
Noor, 1995	Professional occupations, secretaries	180	2	6 mths-1 yr	**T1:** age, NA, occupational group **T2:** marital status, parenthood	psychological distress, happiness	ModLR, Poisson R	+	0	×	
Johnson et al., 1995	Physicians	495	2	1 yr	age, gender	job dissatisfaction, psychiatric distress	ModLR	0	–	0	*Social support as predictor*

Table 3.2: Longitudinal studies of the demand – control model – **D**: demands, **R**: resources, + (main effect): increase in strain, – (main effect): decrease in strain, + (interaction): positive interaction [see text], – (interaction): negative interaction [see text], 0: no effect, ×: not tested, **ModLR**: moderated linear regression, **BinR**: binomial regression, **PoissonR**: Poisson regression, **yrs**: years, **mths**: months

STUDY	*POPULATION*	*n*	*No. of waves*	*Time lag*	*Third variables*	*Outcome measures*	*Data analysis*	*Main effect (D)*	*Main effect (R)*	*Interaction effect (D x R)*	*Remarks*
Barnett & Brennan, 1997	Dual earner couples	402	3	12-15 mths	pay adequacy, trait anxiety	psychological distress	ModLR	+	–	0	
Sargent & Terry, 1998	University administrative workers	87	2	6 wks	not included	job satisfaction, job performance, low depressive symptoms	ModLR	+	×	–	
Bosma et al., 1998	Civil servants	10308	2	5.3 yrs	age, gender, employment grade	coronary heart disease	LogR	×	–	0	*Social support as predictor*
Bourbonnais et al., 1999	Nurses	1378	2	18 mths	Type A behaviour	distress, emotional exhaustion	LogR	+	–	×	*Social support as predictor*
Smulders & Nijhuis, 1999	Technicians	1755	4	1 yr	educational level	absenteeism	ModLR	0	0	0	
Rodriguez et al., 2001	Administrative personnel	542	2	2 yrs	age, gender	job dissatisfaction	ModLR	+	–	+	*Social support and locus of control as predictors*

Table 3.3: Longitudinal studies of the demand – control model – **D**: demands, **R**: resources, + (main effect): increase in strain, – (main effect): decrease in strain, + (interaction): positive interaction [see text], – (interaction): negative interaction [see text], 0: no effect, ×: not tested, **ModLR**: moderated linear regression, **LogR**: logistic regression, **yrs**: years, **mths:** months

Various occupational groups were examined in these 18 studies, such as accountants, technicians, nurses, teachers and administrative personnel. The number of participants ranged from 73 (Theorell, Perski, Åkerstedt, Sigala, Ahlberg-Hulten, Svensson & Eneroth, 1988) to 11789 (Muntaner, Tien, Eaton & Garrison, 1991). Most of the studies (14 studies) employed a two-wave longitudinal design. One study (Barnett & Brennan, 1997) included three waves of testing and three studies (Smulders & Nijhuis, 1999; Kawakami, Haratani & Araki, 1992 & Theorell *et al.*, 1988) included four waves of testing. The time lags ranged from 6 weeks (Sargent & Terry, 1998) to 6 years (Karasek, 1979). Most of the studies did not give reasons for their choice of the particular time lag, contrary to Zapf *et al.*'s (1996) recommendations for thorough planning of the follow up periods between the waves. In only two studies (Parkes, 1991; Parkes, Mendham & von Rabenau, 1994) assumptions were made about the presence of certain conditions between waves. The majority of studies did control for confounding (third) variables as recommended by Zapf *et al.* (1996). These included sociodemographic variables such as age, gender, marital status, education level, tenure and grade and personality variables. Noor (1995) controlled for different third variables at different waves. At time one, age, negative affectivity and occupational group were controlled for and at time 2, marital status and parenthood were controlled for. Various outcome variables were measured, such as depression, distress, job satisfaction, exhaustion, absenteeism and symptomatology (somatic or psychological symptoms).

In terms of the statistical procedures used in the studies, fourteen studies used moderated linear regression analysis (ModLR). Four studies used logistic regression analysis (LogR) and one study (Bromet, Dew, Parkinson & Schulberg, 1988) used both moderated linear regression (ModLR) and logistic regression (LogR). One study (Smulders & Nijhuis, 1999) used both moderated linear regression (ModLR) and Poisson regression (Poisson R) and noted that the data performed better under the

Poisson regression (Poisson R). Finally, one study (Kawakami *et al.*, 1992) used binomial regression analysis (BinR).

Summarising the results of the studies, the majority of studies (17 studies) did test for main effects of work demands on job strain (the outcome measures) and fourteen of these studies produced results congruent with theory, finding that job demands increased job strain. Three studies (Smulders & Nijhuis, 1999; Bromet *et al.*, 1988 and Johnson, Hall, Ford, Levine, Wang & Klag, 1995) did not find a significant main effect of job demands on strain.

Sixteen studies examined the main effects of job control on job strain and eleven of the studies were consistent with theory and found that job control reduced job strain. Seven studies, however, incorporated social support as a predictor (Rodriguez, Bravo, Peiro & Schaufeli, 2001; Bourbonnais, Coumeau & Vézina, 1999; Bosma, Stansfeld & Marmot, 1998; Bromet *et al.*, 1988; Daniels & Guppy, 1994; Johnson *et al.*, 1995 and Parkes *et al.*, 1994) and found that social support was better than job control in moderating the effects of job strain. Specifically, four of these studies did find that social support reduced job strain. Two studies (Rodriguez *et al.*, 2001 & Daniels & Guppy, 1994) additionally incorporated locus of control as a predictor and found that locus of control resulted in a decrease in strain.

Finally, fifteen of the studies did examine the interactive effect and one of them (Karasek, Baker, Marxer, Ahlbom & Theorell, 1981) tested it in a subsample of the population. From these fifteen studies, seven found significant interaction effects. In addition, when the interactive effect was tested, the majority of the studies found that high resources resulted in a reduction in the effects of demands on job strain, thus being consistent with theory. Only one study (Rodriguez *et al.*, 2001) found that job dissatisfaction increased further under high resources.

3.3 Diary methodology

The examination of the effect of naturally occurring fluctuations in daily stress on mood and health requires a research methodology that permits many closely spaced assessments. House, Strecher, Metzner & Robbins (1986) stressed the importance of moving beyond cross-sectional studies that measure stress at a single point in time, toward studies that monitor stress at multiple time points (DeLongis *et al.*, 1992).

The use of daily questionnaires is a relatively new approach in the area of stress and health research (Bolger, DeLongis, Kessler & Schilling, 1989a; Stone & Neale, 1982). A diary methodology facilitates the study of the implications of stressors for well-being over succeeding days, apart from looking at the effects of stressors on immediate well-being. Daily diaries are self-report instruments that are completed each day over a period of several weeks. In this way day-to-day variation in stressful events and emotional functioning can be recorded. Each part of the diary covers events or experiences over a brief time period such as a few hours and must be completed at regular intervals (DeLongis, Folkman & Lazarus, 1988). However, some studies have included six or more time-points per day (Brandstatter, 1983). A typical time frame during which participants are asked to keep a diary is 2 weeks (DeLongis *et al.*, 1992). However, researchers have asked participants to keep a diary for a period ranging from one week (Follick, Ahern & Laser-Wolston, 1984) up to 3 months (Clark, Watson, 1988; Larsen, 1987). As mentioned previously, in general, a daily diary design involves I individuals tested over n consecutive days, to produce $I \times n$ data points.

These instruments help resolve the retrospective recall problem since they allow reporting of minor stressors closer to the time they actually occur. This point will be discussed further later on. They also assist in resolving the problem of causality, as they capture information about dynamics of roles that in cross-sectional designs appear static. Furthermore, daily diaries facilitate the study of the effects of stress within

persons over time since they obtain many repeated measurements on the same individuals. In this way they allow the researcher to eliminate temporally stable personality and environmental factors as third-variable explanations (Bolger *et al.*, 1989a). In addition, with the diary methodology alternative explanations can be put forward for the impact of stressors over time. For instance, the persistence of a stressor may increase its emotional impact or it is also possible that individuals adapt to the impact of events over time.

The diary methodology has not been extensively used within the social sciences. Its use has been restricted within a few research domains in the social sciences (DeLongis *et al.*, 1992). These domains include the study of mood (Campbell, Chew & Scratchley, 1991; Larsen & Kasimatis, 1990), common stressful events (Bolger *et al.*, 1989a), menstrual cycle symptomatology (McFarlane, Martin & Williams, 1988), health and illness behaviour (Roghmann & Haggerty, 1972) and personality (Cantor, Norem, Langston, Zirkel, Fleeson & Cook-Flannagan, 1991).

As was previously discussed, a longitudinal design that follows individuals over a period of time to assess possible changes in their mood and behaviour is important and advantageous. In addition, as will be discussed later on, obtaining aggregate measurements (Epstein, 1980) on individuals over time to cancel out the effects of unique situations is equally important. A diary could obtain data that would meet both of these needs (Robbins & Tanck, 1982).

Furthermore, the diary methodology allows the researcher to move beyond the boundaries of the laboratory, thus increasing ecological validity. Furthermore, it enables the researcher to address questions concerning process and change and related causal issues (Hayes, 2000). Focusing on the stress field, the study of daily events is facilitated by a diary methodology. Recent research findings demonstrate the significance of daily events for health and well-being. Finally, aggregation of

information gathered across multiple situations, may give more reliable and valid indicators of an individual's characteristics than could be obtained by a single assessment (DeLongis *et al.*, 1992).

Diary studies have provided significant insights in the field of stress and health. Studies that examined the effect of "day of the week" on mood (Rossi & Rossi, 1977) using daily mood ratings did not confirm the results of other studies that showed retrospective recall of worse mood on Monday. This highlighted the need to employ measures that are less dependent on retrospective recall. Several studies focusing on the relationship between stressors and mood found that daily stressors explained up to 20 per cent of the variance in mood (Bolger *et al.*, 1989a) and that interpersonal conflicts are the most distressing stressors in terms of their effects on mood. In addition, daily stressors were found to be more upsetting to women than to men (Jones & Fletcher, 1996b).

Although the importance of studying daily stress has been established, the nature of the measures used for daily stress questionnaires has been an area of debate. Two approaches have been mainly used: the *daily-life events* approach (Stone & Neale, 1982) and the *hassles* and *uplifts* approach (DeLongis *et al.*, 1982), both attempting to improve on the classic *life-events* methodology of Holmes & Rahe (1967). The approaches involve asking the participant to rate events in terms of several subjective dimensions, for instance the extent to which the event is perceived as a hassle (Bolger *et al.*, 1989a) or the desirability of the event (Stone & Neale, 1984). This type of approach has been criticised for confounding dependent and independent variables (Dohrenwend & Shrout, 1985). An alternative approach involves the study of the effects of job characteristics rather than daily events. This approach stems from the job characteristics approach (Warr, 1987) and involves asking individuals to rate the characteristics of their work on a daily basis and the fluctuations of this pattern are of primary importance. The

focus is therefore not on events but on those work characteristics, which have been treated as static in cross-sectional research, but may fluctuate from day to day (Jones & Fletcher, 1996b).

One of the most valuable advantages of the diary approach is that it brings the task of data collection into the individual's everyday world. It is widely acknowledged by researchers that context has a significant effect on what the individual remembers, on what he/she feels and on how open he/she is to suggestions. Therefore, a method that provides the researcher with data that have been recorded in the daily context of the participant's lives is very valuable (Hayes, 2000).

Another equally important advantage of the diary is that it allows the examination of change over time. Most forms of research provide the researcher with a "snapshot" of what is happening at a particular moment, ignoring the time dimension. However, this can be unreliable since a person's actions are part of a whole sequence of activity (Hayes, 2000).

The cost-effective dimension of the diary method should not be ignored, as it is an economical and practical way of gathering data over a long period of time. In addition, the diary may encourage honesty and facilitate the collection of very personal information, as it is a reasonably private way of collecting data (Breakwell & Wood, 1995).

The literature suggests that individuals are not very good in recalling events, moods or cognitions (Bem & McConnell, 1970; Wixon & Laird, 1976). Respondents have demonstrated poor recall of alcohol consumption (Lemmens, Knibbe & Tan, 1988), menstrual mood changes (McFarlane *et al.*, 1988), and reports of various moods (Stone, Hedges, Neale & Satin, 1985). Verbrugge (1980) mentions two main types of recall error; *memory lapse* that involves forgetting an event entirely and *telescoping* that involves forgetting the details associated with a particular event. It is evident that a

diary methodology would minimise both kinds of recall error, as it involves reporting of events shortly after their occurrence (McKenzie, 1983; Stanton & Tucci, 1982; Verbrugge, 1980).

Furthermore, a diary methodology contributes to the validity and reliability of research since research methods that involve frequent self-reports of experiences over relatively short time periods will provide more reliable and valid data than that obtained from a few widely spaced assessments.

Diaries provide a time series of data for each individual and enable analysis of variations over the whole diary period and day-to-day analysis. The data from the whole diary period can be analysed at the within-individual level and may also be aggregated in order to obtain reliable averages across individuals or days. A further advantage is that the diary data may be "pooled", sometimes referred to as disaggregation, by combining all days for all persons in an $I \times n$ array. In addition, diaries facilitate the study of fluctuations in an individual's health and the causal relationships among the variables since the events are clearly ordered in time (Verbrugge, 1980).

One issue of concern to researchers is whether respondents will agree to do the sizeable task of keeping a diary. Respondent co-operation, dropout and attrition problems should be considered, since a diary study involves completion of questionnaires usually for a period of several weeks. However, prior studies have achieved high rates of agreement to keep a diary and high rates of continuation to the end of the diary period. Among diary starters, people who quit do so early in the diary period. In addition, and perhaps surprisingly, both agreement to keep the diary and completion rates do not seem to be linked to the length of time the respondents are asked to maintain the diary. Long diary periods improve the stability of estimated rates and provide better data for individual-level analysis (Verbrugge, 1980).

Furthermore, the amount of dropout can be reduced if researchers keep in contact with their research participants. Personal contact with the researcher and the opportunity to express their individual experiences, can maintain motivation in smaller studies and the use of reminders can back this up very effectively (Hayes, 2000).

Lastly, although the commitment required for completing a diary for a substantial period of time might initially be linked with high attrition rates, the studies available do not support such a link. For instance, Bolger *et al.* (1989b) note that, in a sample of 166 married couples, 74% who agreed to complete diaries for a total of 42 days actually did so. Similarly, Clark & Watson (1988) found that all of the 18 Japanese upper class students who began their 3-month study completed it. In a study of 85 married couples across 6 months (DeLongis *et al.*, 1988) 10 dropped out, yielding an attrition rate of less than 12%. Despite these optimistic attrition figures, researchers should consider practical solutions for retaining respondents in a diary study. Research staff should be available in order to assist in the completion of the diary. As previously mentioned, frequent reminders in the form of letters and telephone calls are necessary.

Although several researchers are concerned regarding the data quality of diaries, evidence suggests that when respondents are monitored and actively encouraged throughout the diary period, they produce diaries with a few missing and unclear responses (Verbrugge, 1980).

Finally, since a diary methodology involves the completion of questionnaires on a regular basis, sensitisation effects should be considered. These involve the possibility of heightened awareness of the stressful events being monitored and of a change in behaviours and attitudes under investigation as a result (Verbrugge, 1980). Although research has not been very consistent (Lipinski, Black, Nelson & Ciminero, 1975; Porter, Leviton, Slack & Graham, 1981), an increase in symptom reporting is noted and is interpreted as a result of increased awareness and focus on symptoms. On the other

hand, studies that involve record keeping of non-health related behaviours have found no change over time in the phenomena being recorded (McKenzie, 1983).

The superiority of diary designs in studying temporal processes lies in the fact that they involve intensive longitudinal assessments. They provide detailed and rich descriptions of specific moments or events in a person's life. The data allow researchers to examine their questions of interest from a between-person (nomothetic) and within-person perspective (idiographic) simultaneously.

3.3.1 General recommendations for a diary study

The actual layout of the diary can be very influential. The instructions given, preferably inside the diary, should be clear and unambiguous. Diaries should be small enough to carry around, especially if they require multiple completions each day (Howarth & Schokman-Gates, 1981). Furthermore, respondents seem to like the opportunity, especially if it is left as an option, to describe in an open-ended way any special events or experiences they had during the day.

An important consideration in a diary study is the diary-keeping period. The period should be long enough to capture the events of interest without risking successful completion and dropout by imposing an excessively time-consuming task.

Face to face recruitment rather than recruitment by post is recommended for high response rates. Providing the diary keepers with information about the research and assuring them confidentiality and giving the respondents the sense that their time and help is appreciated are thought to influence co-operation. Finally, it may be useful to emphasise to respondents the importance of the study and their participation in it.

Before the main diary study is undertaken, a pilot study should be conducted in order to test the methods and procedures. Specifically, any ambiguities in the wording of the questions can be traced and the reliability of the diary and perceived relevancy of

items can be examined. Additionally, researchers will be able to determine how long it takes respondents to complete the diaries.

In conclusion, the use of structured diaries for the study of daily events holds many advantages over traditional experimental and survey methodologies. Diary studies are more conducive to the study of naturally occurring change, or process, within hours or days or even across a few months. In addition, it is less susceptible to a host of recall biases present in research designs that require respondents to remember events and experiences over longer time period.

CHAPTER 4

METHODOLOGY

4.1 General introduction

The present study is aimed at examining the demand – control model in a longitudinal and a cross-sectional framework, using a number of analytic procedures. It was carried out in two hospitals in the North West area of Greece. The sample comprised the nursing staff of the above hospitals.

The hospital context was selected because of its strong association with work stress (Hockey, Payne & Rick, 1996; Firth - Cozens, 1987; Spurgeon & Harrington, 1989). In addition, nurses represent a particularly suitable sample for investigating stress (Vredenburgh and Trinkaus, 1983). According to Hingley (1984), nursing is, by its very nature, an occupation subject to a high degree of stress. The recognition that stressors are a pervasive feature of the nursing role and work environment emphasizes the importance of examining how nurses adapt to or cope with stressful work experiences (Parasuraman & Hansen, 1987).

Two designs were employed in the study, a longitudinal one and a cross-sectional one. The longitudinal design, supplemented by a cross-sectional survey, made it possible to analyze aspects of individual development. A structured diary methodology was employed, allowing us to keep track of the participants' experiences, emotional responses to work and psychological health. The diary was followed by a set of questionnaires that provided valuable additional information on the participants' perception of their work environment, their job satisfaction, and their well-being.

4.2 Procedure

Initially, a letter was sent to two hospitals on the North West area of Greece in order to ask for permission to conduct the study there. The purpose of the study along with the methodological requirements in terms of the distribution and the collection of the questionnaires were included in the letter.

After obtaining permission from the two hospitals, the researcher proceeded to the distribution of the questionnaires. On both occasions the diary was distributed initially, followed by another set of questionnaires. Confidentiality and anonymity were ensured by creating personal codes and labeling both the diary and the questionnaire by a numerical code. Coding was an important element in the distribution of the questionnaires, due to the necessity of ensuring that the same participant would complete the questionnaire on both waves of data collection. In addition, it was dictated by the need to reassure the participants that their data would be strictly confidential.

Initially the researcher, with a hospital representative, approached the nursing staff explaining the purpose of the study, assuring strict confidentiality and stressing the voluntary nature of participation. During this stage, the researcher handed out the questionnaires to the nurses that agreed to participate. Most of the questionnaires were handed out in person and collected by the researcher. Other data collection methods included having a contact person inside the hospital that collected the questionnaires (sealed in envelopes).

Once the diaries were handed to either the researcher or the contact person, the participants were given another set of questionnaires, which had to be completed on a single occasion. These included several demographic data as well and the participants were

asked to complete them and return them (sealed in envelopes) to the researcher or the contact person inside the hospital.

4.3 Longitudinal study

The study was planned to include two waves of data collection on the same participants – spaced about one year apart. The first wave of data collection was carried out in May 2000 (and lasted approximately 5 months) and the second wave was carried out in mid-February 2001 (and lasted approximately 6 months).

4.3.1. Sample

At time 1, from the approximately 500 nurses that were given the diaries, 226 completed and returned them to the researcher. This represented a response rate of 45%. Almost nine months later, at time 2, the 226 nurses were given another identical diary questionnaire. At time 2, out of the 226 diaries given, 141 were completed and returned to the researcher. This represented a response rate of 62%. The attrition rate across the two waves was 38%. Of those that did not take part on both occasions there was a dropout due to sickness, leave of absence etc. This probably somewhat reduced the variation within the sample since sick leave is shown to be positively and moderately correlated to perceived strain (Tellenback, Brenner & Loefgren, 1983).

4.3.2. Diary

The first type of questionnaire employed in the present study was a structured daily diary. The term "diary" refers to a booklet that contains a series of identical self-report questionnaires (DeLongis *et al.*, 1992). Such an approach recognises that there are day-to-

day differences, over and above any average level of demand, and that these vary from clinic to clinic and from person to person. This diary consisted of a battery of questionnaires that measured *work experiences, mood, minor health complaints, effectiveness* and *effort.*

The diary was designed as a booklet that had to be completed for 24 working days. A sample day of the diary can be found in appendix 1. General information about the measures and detailed instructions for the completion of the questionnaire were included in the booklet and can also be found in appendix 1.

On each day of the 24-day diary period, participants completed a brief questionnaire in which, as mentioned above, they reported their *work experiences, mood, minor health complaints, effectiveness* and *effort.*

The participants were requested to complete the diary only during the morning and the afternoon shift, but not during the evening shift. Research has shown that the night shift is most associated with increased sleepiness and distractibility and reduced alertness. Reduced motivation is also found in night shifts (Dalbokova, Tzenova & Ognjanova, 1995). It is evident from the above that the night shift requires different treatment from the other two shifts and therefore was not included for examination.

Each day of the diary was divided in 2 parts and the participants were asked to complete these parts at specific times and make a note of these times. They were encouraged to complete the two parts during the time periods indicated in the diary; however, if they were unable to do so, they were asked to note the actual completion time on that day. The first part had to be completed at the end of their work shift and included questions on their *work experiences* on that particular day. The second part was intended to

be completed in the evening (before going to bed) and included the previously mentioned measures of *general mood, minor health complaints, effectiveness* and *effort.*

Translation: The questionnaires were translated by a native speaker and any ambiguous items were discussed with the researcher.

4.3.2.1 Diary measures

A. Work characteristics

Measures of *work demands* (emotional, problem solving, mental and physical demands) and of *resources* (control and support) were included in the first part of the diary. The participants were asked to indicate the extent to which the given statements reflected their work experiences on a given day. A 9-point response scale was used, ranging from "not at all" to "very much". The scales that measured *emotional demands, physical demands* and *support* were based on Hockey and Gervais' measures (Gervais & Hockey, in press), which were developed for a study conducted in British nursing staff. *Problem-solving demand* and *control* scales were based on the scales developed by Jackson *et al.* (1993) in the context of advanced manufacturing technology, with several modifications. *Mental demands* and *social support* measures were developed for the purposes of the present study. Following suggestions by Wall *et al.* (1996), the scales included purely descriptive items, without an affective component, thus contributing to the objectivity of the scales.

Emotional demands. This type of demand refers to tasks or encounters which put a load on the individual's emotional capacity and which challenge his/her emotional stability. They are strongly linked to interpersonal events, particularly within caring professions such as

nursing and social work. Their emphasis is on goals that concern the welfare of others (Hockey, 2000). The scale included items such as "I had to deal with my own personal problems" and this type of demand was measured by four items (3, 11, 13, 14: Appendix 1).

Physical demands. This refers to tasks which place a load on the individual's musculo-skeletal system and to work requiring overt physical activity (but not necessarily mentally demanding) and was measured by 2 items. Sample items include: "My job required a lot of physical effort" (items: 12,17: Appendix 1).

Mental demands. These reflect cognitive processing and refer to tasks that stretch the individual's mental capacity. They impinge primarily on the brain processes involved in information processing and involve attention, concentrating and monitoring. Sample items include: "I had to work quickly most of the time". *Mental demands* are measured by 4 items: 2, 7, 15, 16 (Appendix 1).

Problem-solving demands. These refer to active cognitive processing required to prevent or recover errors (Jackson *et al.,* 1993). Items such as " I had some difficult decisions to make" refer to *problem-solving demands*, which are measured by items 5 and 6 (Appendix 1).

It should be noted that the above-mentioned types of demands were grouped in one overall measure of demands in order to facilitate the statistical analysis.

Control. This refers to the opportunity one has to use discretion and to determine the scheduling of his or her work behaviour and was measured by 4 items: 1, 8, 9, 18 (Appendix 1). Sample items include: "I could take a break whenever I needed to".

Support. This refers to the availability of help and support from colleagues and was measured by 2 items: 4, 10 (Appendix 1).

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. After its initial articulation the model was later expanded by the inclusion of social support as a third dimension (Johnson, 1986; Kristensen, 1995), thus adding a social dimension to it. In the expanded model tests of the interactive hypothesis are commonly conducted by means of moderated hierarchical regression analysis. In the regression procedure the main effects of demands, control and support are initially entered, followed by the two-way interactions of demands x control and demands x support, and finally the three-way interaction of demands x control x support. In order to simplify the analysis and to ease the interpretation, control and support were combined into the above-mentioned factor of resources. Moreover, in the initial pilot study that was undertaken, resources indicated an acceptable level of reliability (Cronbach's $\alpha = .61$), further justifying their grouping as a single moderating variable.

B. General mood

Moods are a general indicator of different states of well-being. It has generally been assumed that moods vary across days of the week (Wilson, Laser & Stone, 1982). Considerable research indicates that emotional experience is dominated by 2 broad and largely independent mood dispositions – negative affect and positive affect. The examination of both factors is important in the study of how mood relates to various phenomena (Watson & Pennebaker, 1989; Watson & Tellegen, 1985). Two general mood dispositions, referred to as negative affect and (low) positive affect, were assessed in the second part of the diary. The participants were asked to indicate their general mood on that particular day.

Negative affect is a general dimension of subjective distress. The NA factor includes a broad range of aversive mood states, including anger, disgust, scorn, guilt, fearfulness, and depression (Watson & Pennebaker, 1989). In contrast, positive affect (PA) reflects one's level of energy, excitement, and enthusiasm. However, context-free measurements of PA may have limited value in occupational or task contexts, since they do not reflect the short-term energetic response to job demands (Hockey, Payne & Rick, 1996; Warr, 1990). Therefore, the PA dimension was reversed and shifted towards the arousal axis in order to reflect *fatigue*, rather than alertness/energy. The negative affect dimension was modified (Hockey, Payne & Rick, 1996) to reflect *anxiety* and *anger* and the positive affect dimension was reversed to emphasise *fatigue* and *depression.*

The ***anxiety*** items included: (high) tense, worried; (low) calm, relaxed.
The ***depression*** items were: (high) sad, miserable; (low) cheerful, enthusiastic.
The ***fatigue*** items were: (high) tired, worn out; (low) full of energy, lively.
The ***anger*** items were: angry and annoyed.

For each item a 9-point response scale was used, ranging from 1 (not at all) to 9 (very much). Mean *fatigue, anxiety* and *depression* scores were obtained by averaging the four items of each dimension (with reverse scoring for "low" items). Mean *anger* was obtained by averaging the two items representing anger.

C. General health complaints

Health complaint scales have been widely used in health psychology research, mainly due to the fact that psychosomatic complaints are usually a preliminary indication of more intense symptoms such as anxiety and depression. A seventeen-item scale was used to assess *health complaints.* The items were created based on the Brief Symptom Checklist (Derogatis & Melisaratos, 1983), the symptom checklists used by Pennebaker (1982) and measures that were used in diary studies (Billings & Moos, 1982; Delongis *et al.,* 1982). The scale used items that are typically used in other measures and several items that were specific to the purposes of the present study. The scale included 14 items referring to somatic symptoms and minor illnesses (e.g. headaches, cold or flu symptoms) and 3 items referring to cognitive symptoms (e.g. problems of attention or concentration, forgetfulness and slips of mind). The participants were asked to indicate how frequently they had experienced the various symptoms in the last 24 hours. They were rated on a 3-point scale of experienced frequency (0 = not at all, 1 = a little 2 = a lot). The 17 items were combined to produce one measure of the average level of psychosomatic complaints.

D. Effort

To assess the degree of experienced *effort* during the work period, especially when encountering problems, a six item scale was used, with three items representing high *effort* and three items representing low *effort.* The scale was designed for the purposes of the

present study and was based on a scale developed by Hockey, Wastell & Sauer (1998) for the purposes of their research. Participants were asked to indicate how they reacted on the particular day when faced with problems that made their job difficult. Items such as: " I tried not to go beyond my limits while working" (low *effort*) and "I worked harder to make sure that my jobs were completed" (high *effort*) were included. For each item a 4-point response scale was used, ranging from 1 "not at all" to 4 " very often". The effort items can be found in Appendix 1.

E. Personal Effectiveness

The individual's perception of his effectiveness at work at that particular day was assessed by a single question. The participants were asked to indicate the degree of their effectiveness during their work on that day. A 9-point response scale was used, ranging from 1 "not at all effective" to 9 " very effective".

Illness/medication/Treatment. At the end of each day the participants were asked to indicate whether they had taken any drugs (pain-killers etc.) in the last 24 hours and if they usually are off work through illness. Finally, they are asked to indicate whether they are under medical treatment and whether they visited their GP.

4.4 Cross-sectional study

As previously mentioned, a cross-sectional survey, supplementing the longitudinal study, was conducted. This involved the distribution of a set of questionnaires assessing different aspects of the participants' work environment and everyday life.

4.4.1. Sample

In the cross-sectional study, from the 1000 questionnaires that were distributed to the two hospitals, 423 were returned to the researcher in a usable form. This represented a response rate of 42%. The sample consisted of solely female nurses and 270 were married (64%). 131 (31%) participants were single, 6 (2%) were divorced and 1 (.2%) was widowed. 272 (65%) participants had children.

In the second wave of data collection, 423 questionnaires were given to the same participants. Additional data on tenure and education were included.

From the 423 questionnaires, 255 were returned to the researcher. This represents a response rate of 60%. The attrition rate for this study across both waves was 40%.
The demographic profile of these 255 nurses was as follows: 255 (100%) were female, 157 (62%) of the participants were married, 80 (31%) were single, 4 (2%) were divorced and 1 (.4%) was widowed. 171 (67%) had children.

4.4.2. Questionnaire

After the completion of the diaries, the participants were presented with another set of questionnaires that were intended for completion on a single occasion. This second questionnaire comprised the following scales: *job characteristics, work feelings, general well-being (GHQ12), minor health complaints, job satisfaction and effort.*

At the end of this questionnaire, the participants were asked to indicate any serious medical/health problems that they may have experienced over the past two years and the number of visits that they made to their GP during the past year (ranging from 0 to 5 and above).

Finally, some personal/biographical data were included in the same questionnaire. These included the participant's age, sex, marital status, tenure, educational background, number of children (age, sex) and the ward in which they were working.

4.3.2.1 Questionnaire measures

A. Job characteristics

Job characteristics were measured using a 33-item scale based on the scales developed by Jackson *et al.*, (1993) for the manufacturing industry.

Jackson *et al.* (1993) aimed to develop measures of five constructs through self-report scales that would be widely applicable, reliable, factorially distinct, and sensitive to expected differences between different kinds of jobs. They focused on jobholders' perceptions of the variables, because psychological effects would be expected to depend on people being conscious of them. Several modifications were introduced by altering the wording to make the questions more appropriate for nurses and by adding a number of items that addressed the specific job content of this occupation.

The nursing profession is acknowledged as involving heavy physical workload (Hockey, 2000). Items measuring *physical demands*, although not included in Jackson *et al.*'s (1993) original scale, were therefore included in the questionnaire. These items were developed by Hockey and Gervais (Gervais & Hockey, in press) for a study undertaken on British nursing staff. In addition, *emotional demands* are particularly relevant to caring professions, due to the nature of the particular job. Their inclusion in studies on health care organizations has been recommended by several researchers (de Jonge, Mulder & Nijhuis, 1999; Söderfeldt *et al.*, 1997). Additional measures of *emotional demands*, based on

Hockey and Gervais' measures and modified for the purposes of the present study were thus included in the questionnaire. Finally, *social support* has also been acknowledged as a particularly important characteristic of nursing and its buffering ability has been demonstrated in several studies, particularly in the presence of high *emotional demands* (Dollard & Winefield, 1998; Parkes, Mendham & von Rabenau, 1994; Moyle, 1998; Tyler & Ellison, 1994). Based on the above, items for the assessment of *social support* were incorporated in the questionnaire.

In the *production responsibility* scale (Jackson *et al.,* 1993) some items were modified to make them more suitable for the nursing profession, focusing on patients rather than machinery ("could alertness on your part help prevent serious problems for patients?") and other items were retained from Jackson *et al.*'s (1993) scale ("could a lapse of attention result in expensive damage to equipment or machinery?"). The revised "production responsibility" scale was re-labeled *responsibility demand.*

Monitoring demands. They refer to the extent of the passive monitoring required on the job (Jackson *et al.,* 1993) and was measured by four items (1, 11, 14, 19: Appendix 1). Sample items include: "Does your work need your undivided attention?"

Cognitive demands. They reflect active, cognitive processing required for the prevention of errors and general workload and was measured by six items (10, 20, 25, 27, 31, 32: Appendix 1). The scale includes 4 items assessing *problem-solving demands.* Three items (items 20, 25, 31) were derived from the *problem-solving demands* scale (Jackson *et al.,* 1993) and one additional item measuring *problem-solving demands* was included (item 10: does your job require you to be able to think on your feet?). Two items measuring *general workload/time pressure* (Items 27 and 32) as measured by the NASA TLX (Task Load

Index) scale (Hart & Staveland, 1988) were also included in the *cognitive demands* scale. Items such as "Do you come across problems in your job that you haven't met before?" refer to *problem solving demands* and items such as "Do you have to put a high level of mental effort into your work?" and 'Do you need to work quickly?" refer to *mental workload.*

Responsibility demands. This type of demand is associated with a heavy burden of responsibility for the welfare of others. Items such as "could an error on your part result in a threat to a patient's welfare?" were included and this type of demands was represented by four items (3, 9, 16, 29: Appendix 1).

Emotional demands. This type of demand is strongly linked to interpersonal events and they complete strongly for the control of attention (Taylor, 1991). Sample items include: "Is it part of your job to listen to other people's problems?" and "do you need to take care of upset patients or relatives?". *Emotional demands* were represented by the following items: 13, 18, 23, 26, 33 (Appendix 1).

Physical demands. This type of demand is associated with hard physical work. Sample items include "does your work involve a lot of heavy lifting and carrying?" and was represented by 3 items: 2, 21, 28 (Appendix 1).

The scales consisted of solely descriptive items such as "To what extent does your job need your undivided attention?" and "Do you have to solve problems which have no obvious correct answer?". For each item a five-point response scale was used and the response alternatives were labelled: not at all (1), just a little (2), a moderate amount (3), quite a lot

(4) and a great deal (5). A total score is obtained by averaging item scores, with higher values representing greater demand.

Job control was assessed by 9 items based on Jackson *et al.*'s (1993) scales. Again the items were modified in order to reflect the requirements of the nursing profession. A five-point response scale was used, ranging from 1 (not at all) to 5 (a great deal) and the total score is obtained by averaging the item scores, with higher scores representing greater control. The internal reliabilities (Cronbach's α) of the scales are above 0.80 (Jackson *et al.*, 1993).

Timing control. This refers to the individual's opportunity to determine the scheduling of his or her work behaviour and was measured by three items (4, 5, 24: Appendix 1).

Method control. This refers to the individual choice in how to carry out given tasks (Jackson *et al.*, 1993) and was measured by six items (7, 8, 12, 15, 22, 30: Appendix 1).

All these items such as, "Can you decide the order in which you do different parts of the job?" and "Can you decide when to start work and when to leave?" are focused clearly on *control* itself and do not encompass elements such as skill use and task variety which are characteristics of the *decision latitude* measures (Wall *et al.*, 1996).

Support was measured by two items (6,17: Appendix 1) and focused more on *co-worker support.* Sample items include: " Is there much support from colleagues when things go wrong?".

B. 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 *et al.,* 1996). The rotated structure is preferred as the basis for the present research, as it provides a more suitable framework for measuring changes in well-being under stress or task demands (Hockey *et al.,* 1998; Warr, 1990). As previously mentioned, the positive affect dimension was reversed to emphasise *fatigue* rather than alertness, and affect terms were chosen to emphasise short-term responses to work. The reversal of the positive affect dimension allowed *anxiety, anger, depression* and *fatigue* to be interpreted as 4 dimensions of subjective strain (Hockey, 1993, 1995). The negative affect dimension was similarly modified to reflect *anxiety* and *anger.* The relatively small number of items in this checklist was adopted in order to minimise the daily demands on the participants and to encourage completion for the diary for 24 days. Scale reliabilities from accumulated use of the measures of anxiety, depression and fatigue over a number of studies are acceptable: Cronbach α for anxiety = .78, for depression = .88 and for fatigue = .83 (Hockey, Maule, Clough & Bdzola, 2000).

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 ***anger*** items were: angry, annoyed.

The items were arranged in such a way that no more than two successive items referred to *anxiety, fatigue, depression or anger.*

The participants were asked to indicate the degree in which they experienced the above during work. For each item a 9-point response scale was used, ranging from 1 (not at all) to 9 (very much).

C. Job satisfaction

Warr, Cook and Wall's (1979) 15-item *job satisfaction* scale – an instrument with well-established psychometric properties – was used.
Four items (2, 6, 8, 14: see Appendix) measured *job itself intrinsic satisfaction.*
Five items (1, 3, 5, 13, 15: see Appendix) measured *working conditions extrinsic satisfaction.* Six items represented *employee relations' satisfaction.* This sub-scale suggests a concern for individual recognition and management behaviour (Warr *et al.,* 1979) and is measured by the following items: 4, 7, 9, 10, 11, 12 (Appendix 1).

A seven-point response scale running from "extremely dissatisfied" to "extremely satisfied" was used. Total scores are the average of the item scores, with higher values representing greater satisfaction. The internal consistency (Cronbach α) of the scale is very good ($\alpha = 0.90$). Internal consistency for the intrinsic job satisfaction is $\alpha = 0.86$ and for the extrinsic job satisfaction is $\alpha = 0.80$ (Warr *et al.,* 1979).

D. General health complaints

A thirteen-item scale modified from Watson and Pennebaker's (1989) analysis was used to assess *health complaints.* The scale included 10 items referring to somatic symptoms and minor illnesses (e.g. aches, eyestrain, poor appetite etc.) and 3 items referring to symptoms of cognitive failure (e.g. problems of attention or concentration, forgetfulness and slips of mind). The participants were asked to indicate how frequently

they had experienced the various symptoms over the previous week. They were rated on a 3-point scale of experienced frequency, 0 = not at all, 2 = a lot. All items were summed to give a score of psychosomatic complaints.

E. Effort

The same 6-item *effort* scale based on Hockey *et al.*'s (1998) study and which was included in the diary was used in the questionnaire. The aim was to assess the degree of experienced *effort* during the work period. In the questionnaire, however, participants were asked to indicate their reactions over the previous month and not on that particular day of completion when faced with problems that made their work hard. They were therefore asked to report retrospectively their experienced perceived *effort.* As previously noted, 3 items represented high *effort* and 3 items represented low *effort* and they were randomly arranged in the questionnaire. Sample items include: " I tried very hard to continue to work effectively" (high *effort*) and " I left some of the most demanding jobs for later" (low *effort*). For each item a 4-point response scale was used, ranging from 1 "not at all" to 4 " very often".

It should be pointed out that the above items were modified or rewritten and the response scale was changed to a 4-point scale, on the basis of a pilot study that was undertaken and will be described in Chapter 5.

F. General well-being (GHQ-12)

The measure of distress was a standardised screening instrument devised for assessing through self-report the probability of minor psychiatric disorder. This was the *General Health Questionnaire*, a measure that has high validity and reliability in community

investigations (Goldberg, 1978). The 12-item version of the *General Health Questionnaire* (GHQ12, Goldberg & Williams, 1988) was employed, which has been shown to be acceptable and useful in occupational research (Jackson *et al.*, 1993). Items are rated on a fully-anchored 4-point scale, ranging from 1 (not at all) to 4(most of the time). 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.

G. Personal/biographical data

Data were also collected on the following variables: the participants' *age* (in years), *gender, marital status* (married, divorced, single, widowed), *parental status* (number of children, age of children), *tenure* and *education*. Frese (1985) refers to them as intervening (third) variables that have to be controlled in order to rule out any spurious effects with the predictors. In addition, information on *specialty* and *wards* was obtained, as the stress levels and job satisfaction level has been found to differ between wards and specialties (Haynes, 1991).

Marital status has also been shown to affect the psychological well-being of women (Verbrugge, 1983). As mentioned above, data on *parental status* were also collected. According to Karasek, Gardell & Lindell (1987), parenthood can have a negative impact on the stress levels of employees, particularly women. In contrast, Marcus & Seeman (1981) found that parenthood has a positive impact on women's health.

Information on the participant's age of children was also collected, as having very young children is often associated with more physical symptoms (Thompson & Brown, 1980).

CHAPTER 5

PILOT STUDY

5.1 General introduction

The study was conducted in Greece, a country in which – to the best of our knowledge – the demand–control model has never been examined. Additionally, a diary-based framework was employed for the examination of the model. In order to obtain an initial indication of the reactions and possible obstacles that could arise from a longitudinal diary-based study in another cultural context, a pilot study was initially undertaken. The methods and procedures were therefore tested on a sample of Greek nurses.

Fox *et al.* (1993) emphasized the suitability of the nursing profession for the investigation of occupational stress and for testing the demand – control model in particular. Apart from the self-evident stressful nature of the work, nursing is characterized by enough variance in exposure to stressors, due to the heterogeneity of the different nursing areas (Landsbergis, 1988). Furthermore, due to the small variance in social class, socioeconomic status, a potential confounder in occupational stress studies, does not act as confounder (de Jonge, Janssen & Van Breukelen, 1996).

The basic methodology employed in the main study and thus tested in the pilot study was a diary methodology. This involved the daily assessment of the individual's work experiences, mood, health complaints, effectiveness and effort.

The aim of this initial pilot work was to discover any ambiguities with the wording of questions, to test the sensitivity of the questions and to check the reliability of the diary booklet and the perceived relevancy of the items. The procedure, the measures and the

analyses are briefly described below. A discussion of the main findings and possible implications are also included at the end of the present chapter.

5.2 Procedure

This pilot study took place between December 1999 and February 2000. The first stage involved approaching the hospital staff in order to ask for permission to conduct the pilot study. The purpose of the study was explained verbally and in writing. After obtaining permission for the study, the procedure of diary distribution and collection was discussed. It was agreed that the most appropriate way would be for the researcher and a member of staff to approach the head of each nursing ward and hand them the questionnaires for completion. All nurses that were working in the hospital at that time were given a diary to complete but this was done through the head nurse of their ward. The nurses were assured in writing that their answers would be strictly confidential and no one would have access to the completed diaries apart from the researcher. They were informed that their participation was not obligatory. An envelope was provided for returning the completed diary and anonymity was guaranteed. During the diary completion period the researcher visited the hospital several times in order to answer questions. From the 420 diaries that were distributed, 165 were returned to the researcher in a usable form. This low response rate (39%) had partly to do with refusal to participate as far as we were informed. The low compliance of the nurses was mainly due to the limited accessibility of the researcher to the different wards. This resulted possibly in limited information and not enough encouragement to complete the diary, something that is of primal importance in this type of study that involves a diary methodology.

5.3 Diary methodology

A daily research design facilitates the study of daily fluctuations in work experiences, mood, health complaints, effectiveness and effort. The pilot study, therefore, employed a structured daily diary methodology. The diary consisted of several scales that assessed the above-mentioned concepts.

In the pilot study the diary had to be completed for 16 working days. The cover pages of the diary contained information on the measures used in the diary, instructions regarding the completion and contact numbers for possible questions. A sample of the diary and of the instructions and information given can be found in appendix 1.

Each day of the diary was divided in 2 parts and each part had to be completed at specific times during the day. However, it was emphasised that the diary had to be completed only when doing the morning or the afternoon shift but not when they were working on the night shift. On each day of the 16-day diary period, participants completed a brief questionnaire in which they reported their work experiences, mood, minor health complaints, effectiveness and effort. The first part of the diary included the work experiences and had to be completed after the end of their shift. The second part had to be completed in the evening and included the mood, health complaints, effectiveness and effort scales. Participants were also asked to indicate if they had been taking any medication or if they were under treatment. Details on the completion times and on the scales were included on each part of the diary.

A native speaker translated the questionnaires and any ambiguous items were discussed with the researcher.

5.3.1 Measures

As previously noted, measures of work experiences, mood, minor health complaints, effectiveness and effort of the participants were included in the diary for assessment. These are briefly described below.

5.3.1.1 Work experiences. Demands, control and support, representing three measures of job characteristics, were assessed in this section of the diary. The demands measures were derived from Jackson *et al.*'s (1993) scales for the advanced manufacturing technology and were modified in order to reflect characteristics of the nursing profession rather than of the manufacturing industry. Four scales were used for the measurement of demands: *mental demands, problem-solving demands, emotional demands* and *physical demands.* Problem-solving demands were based on Jackson *et al.*'s (1993) scales. Mental demands were devised for the purposes of the present study and refer to attention and concentration. Emotional and physical demands were based on the scales developed by Hockey & Gervais (Gervais & Hockey, in press) for their study on British nursing staff. Control was also based on the scales developed by Jackson *et al.* (1993) and the support measures were designed for the study. Most of the measures were modified in order to reflect the hospital context. A 9-point rating scale ranging from "not at all" to "very much" was used and participants were asked to rate their work experiences in terms of demands, control and support, on a given day. Following Wall *et al.*'s (1996) recommendations, the scales included purely descriptive items with no affective element was incorporated in them.

Mental demands. These include demands requiring attention and concentration and were measured by 5 items (Items 2, 7, 9, 15, 16: Appendix 1). Sample items include: " I had a lot of administrative work to do".

Problem-solving demands. These reflect the active cognitive processing required for preventing or recovering errors (Jackson *et al.*, 1993) and were measured by 2 items (item 5 and 6: Appendix 1).

Emotional demands. These are defined as the requirement to invest effort in caring for others or responding to emotional events (Söderfeldt, Söderfeldt, Muntaner, O'Campo,

Warg & Ohlson, 1996). Emotional demands were measured by 4 items (items 3, 11, 13, 14: Appendix 1). Sample items include: " my actions helped a very ill patient".

Physical demands. These involve demands requiring lifting, carrying and moving and were measured by 2 items (items 12, 17: Appendix 1). Sample items include: " I had to do jobs that required a lot of heavy lifting and carrying".

Control. Items that assessed how much control the individual has over his or her work included: "I could decide on how to do the jobs I had to do". Control was measured by 3 items (1, 8, 18: Appendix 1).

Support. Two items were included in order to measure the availability of support from colleagues (items 4, 10: Appendix 1). Sample items include: "I had support from my colleagues".

5.3.1.2 Work feelings. Four mood dimensions were assessed, which were derived from Watson & Tellegen's (1985) positive and negative affect conceptualisation of mood dimensions. Positive affect refers to the degree of energy and enthusiasm and negative affect refers to active distress, anxiety and anger. The rotated structure was considered more suitable for measuring changes in well-being under stress (Hockey, Maule, Clough & Bdzola, 2000). Anxiety and anger were conceptually more closely related to negative affect and fatigue and depression are more closely related to (low) positive affect. Four measures of negative mood were included in the present study: *anxiety, anger, fatigue* and *depression.* A nine-point response scale was used ranging from 1 = not at all, to 9 = very much and respondents were asked to rate their mood on a given day.

Anxiety. This mood dimension was measured by 4 items: anxious, tense, relaxed (reversed), at ease (reversed).

Anger. Anger was measured by 2 items: angry, annoyed.

Fatigue. This mood dimension was measured by 4 items: tired, worn out, energetic (reversed), lively (reversed).

Depression. Depression was measured by 4 items: sad, miserable, cheerful (reversed), enthusiastic (reversed).

5.3.1.3 Minor health complaints. Psychosomatic symptoms were measured by 17 items that were developed for the purposes of the present study after considering various somatic symptoms checklists such as the Brief Symptom Inventory (Derogatis & Melisaratos, 1983) and Pennebaker's (1982) symptom checklist. Fourteen items were included that referred to somatic symptoms. Three additional items referring to symptoms of cognitive failure were also included. A 3-point response scale was used ranging from 0 = not at all, to 2 = very much. Respondents were asked to indicate the extent to which they felt each of the psychosomatic symptoms in a given day. Sample items include: eyestrain, upset stomach, and difficulties in concentration and can be found in Appendix 1.

5.3.1.4 Effectiveness. A single item that was developed for the purposes of the present study measured effectiveness. Respondents were asked to indicate the degree of their effectiveness on a given day, on a 9-point response scale ranging from 1 = not at all, to 9 = very much.

5.3.1.5 Effort. This scale included 6 items, and was based on Hockey *et al.*'s (1998) study. Respondents were asked to indicate their reactions on a given day when faced with problems that made their work difficult. A 9-point response scale was used, ranging from 1 = not at all, to 9 = very often. Three items represented low effort and three items represented high effort. Sample items include: "I tried not to ask too much from myself"(low effort) and "I tried to do everything that was asked from me" (high effort). As

will be discussed later on, several items of this scale were modified for use in the main study on the basis of exploratory factor analysis.

5.4 Statistical analyses

Reliability analysis, correlational analysis, factor analysis and hierarchical regression analysis were conducted on the data from the pilot study.

5.4.1 Reliability analysis

Table 5.1 *Cronbach's α for the pilot study variables*

Scale	*No. of items*	α
Emotional demands	4	.73
Mental demands	5	.65
Problem-solving demands	2	.73
Physical demands	2	.85
Control	3	.77
Support	2	.59
Resources	5	.61
Anger	2	.89
Anxiety	4	.82
Fatigue	4	.78
Depression	4	.85
Effort	6	.29

As can be seen from the Table 5.1, most scales reached acceptable levels of reliability, with Cronbach's α coefficient being above .7. Mental demands, social support and resources scales had a Cronbach's α coefficient of .65, .59 and .61 respectively. These internal consistencies are still within acceptable limits. Pallant (2001) noted that when the scale is short, having less than 10 items, it is not uncommon to find quite low Cronbach's values such as .50. The effort scale was the most problematic, with very low internal consistency (Cronbach's α = .29). As will be discussed later on in this section, on the

basis of this low internal consistency and subsequent factor analysis, this scale was restructured and some of the items were rephrased for use in the main study.

5.4.2 Correlational analysis

Table 5.2 Descriptive statistics and correlation matrix of the variables (n = 165)

Variables	*Mean*	*SD*	*DEM*	*RES*	*EFRT*	*STR*	*HC*
Demands (DEM)	5.21	1.2					
Resources (RES)	5.32	.95	.04				
Effort (EFRT)	6.08	.96	.16**	-.09**			
Strain (STR)	4.58	1.06	.16**	.16**	-.22**		
Health complaints (HC)	.38	.31	.17**	-.09**	-.26**	.31**	
Effectiveness	7.04	1.10	-.09**	.18**	.21**	-.21**	-.29**

** $p < .01$

As can be seen from the correlation matrix above, demands showed a moderate positive correlation with effort ($r = .16, p < .01$), as expected. Furthermore, a positive correlation of demands with strain ($r = .16, p < .01$) and health complaints ($r = .17, p < .01$) and a very small negative correlation with effectiveness ($r = -.09, p < .01$) was found, indicating detrimental effects of demands and therefore being consistent with theory. Looking at the resources variable, a very small negative correlation of resources with effort ($r = -.09, p < .01$) and a moderate positive correlation with strain ($r = .16, p < .01$) were found suggesting, quite surprisingly, a negative impact of resources. On the other hand, a very small negative correlation of resources with health complaints ($r = -.09, p < .01$) was found, indicating that beneficial effects of resources, a finding that was expected and congruent with theory. Finally, resources showed a moderate positive correlation with effectiveness ($r = .18, p < .01$), suggesting that the more control and support the individual experiences, the more effective he will be. An interesting result is the moderate negative correlation of effort with strain ($r = -.22, p < .01$) and health complaints ($r = -.26, p < .01$), indicating that effort reduces strain and health complaints and thus demonstrating a

beneficial effect of effort. Additionally, effort showed a strong positive correlation with effectiveness ($r = .21, p < .01$).

Looking briefly at the dependent variables, strain correlated positively with health complaints ($r = .31, p < .01$) and negatively with effectiveness ($r = -.21, p < .01$), as expected. Finally, health complaints showed a moderate negative correlation with effectiveness ($r = -.29, p < .01$), indicating that health complaints reduce effectiveness.

In summary, the correlational analysis showed small to moderate correlations between the variables and almost all of them in the expected direction. An exception was the above-mentioned positive correlation of resources with strain, a finding that was not consistent with theoretical expectations.

5.4.3 Factor analysis

Factor analysis is a statistical technique that enables the researcher to discover which variables in the set form coherent subsets that are relatively independent of one another. The variables that show strong correlations with each other but are independent of other subsets of variables are combined into factors (Tabachnick & Fidell, 1996). Exploratory factor analysis was conducted in the present pilot study. Exploratory factor analysis is usually used in the early stages of research in order to explore the inter-relationships among a set of variables (Pallant, 2001).

The results of factor extraction without rotation can bring about difficulty in their interpretation. Therefore, rotation is recommended in order to improve the interpretability and scientific utility of the solution (Tabachnick & Fidell, 1996). Varimax rotation is the most commonly used orthogonal approach and its contribution lies in the minimization of the complexity of factors by maximizing the variance of loadings on each factor (Pallant, 2001). The scales used in the present study were subjected to a principal components analysis with Varimax rotation with the aim to test the applicability of the classification

adopted from Jackson *et al.* (1993) and Gervais & Hockey (in press) and modified for the purposes of the present study. The results of the analysis will be briefly presented below.

Table 5.3 *Work characteristics items and Principal-components factor analysis with Varimax rotation*

Work characteristics items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Mental demands					
Jobs that needed a lot of concentration	**.86**	.10	.04	.07	.04
I worked for long without a break	**.85**	.19	.04	.07	.00
I had to work quickly most of the time	**.86**	.20	.05	.09	-.03
I had a lot of administrative work	**.86**	.15	.06	.08	-.04
I had enough time for breaks	-.35	-.25	.09	-.13	-.17
Physical demands					
A lot of heavy work to do- carrying etc.	.28	**.76**	.11	.05	.01
A lot of physical demands on the job	.30	**.74**	.12	.12	.01
Problem solving demands					
I experienced problems with equipment	-.01	**.76**	.16	-.09	-.18
I had to make difficult decisions	.23	**.69**	.25	-.01	-.02
Emotional demands					
I had to help a very ill patient	.02	.10	**.79**	-.04	.02
I had to take care of patients	.11	.20	**.80**	-.06	.03
I had to help upset people	-.02	.19	**.84**	-.09	.03
I had conflicts with colleagues	-.04	.03	.18	.06	.03
Control					
I had control over my use of time	.18	.04	-.01	**.78**	-.03
I could decide the way to do the jobs	.04	-.01	-.14	**.85**	.08
I could decide what to do next	.08	.03	-.05	**.84**	.02
Support					
I had support from colleagues	-.02	.04	.08	.11	**.80**
My colleagues gave me a lot of help	.00	-.13	.24	-.05	**.68**
Percentage of variance explained	**19%**	**14%**	**12%**	**12%**	**9%**

Response scale for the work characteristics items: 1 (not at all) – 9 (very much)

Initially a principal components analysis was performed in order to check the dimensionality of the work characteristics scales adapted from Jackson *et al.* (1993) and Gervais *et al.* (in press).

A principal component analysis with Varimax rotation of the 18 items chosen to measure the above-mentioned work characteristics was performed. We were interested in checking the independence of the six scales. The five-factor solution that appeared explained 66% of the total variance. Principal components analysis revealed the presence of five factors with eigen values exceeding 1. An inspection of the scree plot revealed a clear break after the fifth component. On the basis of Kaiser's criterion (eigen values greater than 1) and Cattell's (1966) scree test, it was decided to retain a five-factor solution. Table 5.3 shows the loadings of the five factors after Varimax rotation. Items that loaded greater than 0.4 were included as reliable indicators of the relevant constructs (Kline, 1994; Tabachnick & Fidell, 1996).

Factor 1 combined the four items of *mental demands*, but not the fifth item measuring mental demands, suggesting that it was rather problematic. This will be discussed further later on. This Factor explained 19% (eigenvalue = 4.55) of the total variance. Factor 2 combined the two items of *physical demands* and the two items of *problem-solving demands* and this factor explained 14% (eigenvalue = 2.71) of the total variance. Factor 3 combined the three items of *emotional demands* and explained 12 % (eigenvalue = 1.78) of the total variance. The fourth item of *emotional demands* showed a very low loading (.18) in this factor. This will be considered later on. Factor 4 combined the three measures of *control* and also explained 12 % (eigenvalue = 1.60) of the variance. Finally, Factor 5 combined the two items of *support* and explained 9 % (eigenvalue = 1.12) of the total variance.

This analysis partly confirms the dimensionality of the work characteristics measures. The 18 items did not tap all the *a priori* dimensions. There were four clear factors corresponding to the relevant scales, with only two problematic items, one in emotional demands and one in mental demands. The two problematic items were subsequently modified for the main study. The item of emotional demands "there were

conflicts with colleagues" was changed into "I had to deal with my own personal problems", representing again emotional demands. The problematic item representing mental demands "I had enough time for breaks" was changed into "I could take a break whenever I needed one", thus representing an additional item of control.

Table 5.4 *Mood items and Principal - components factor analysis with Varimax rotation*

Mood items	Factor 1	Factor 2	Factor 3	Factor 4
Depression				
Cheerful (*reversed*)	**-.80**	.10	.14	-.14
Enthusiastic (*reversed*)	**-.83**	.07	.07	.12
Sad	**.80**	.04	.02	.37
Miserable	**.80**	-.01	-.03	.33
Anxiety				
Calm (*reversed*)	.03	**-.78**	-.03	-.19
Relaxed (*reversed*)	-.02	**-.81**	-.05	-.07
Tense	-.04	**.86**	.08	.06
Worried	-.08	**.77**	.07	-.10
Fatigue				
Energetic (*reversed*)	.14	-.02	**-.77**	-.15
Lively (*reversed*)	.04	-.04	**-.78**	.20
Tired	.04	.14	**.78**	-.10
Worn out	-.07	.03	**.78**	.19
Anger				
Annoyed	.22	.06	.01	**.90**
Angry	.22	.13	.03	**.88**
Percentage of variance explained	**20%**	**19%**	**17%**	**14%**

Response scale for the mood items: 1 (not at all) – 9 (very much)

Next, the mood items were subjected to a principal components analysis with Varimax rotation. Four factors were extracted that explained 70 % of the total variance. The factors were not forced but this four-factor solution facilitated the interpretation of the factors, did not indicate any overlap between the factors and corresponded to Kaiser's criterion for eigen values more than 1.

Table 5.4 shows the loadings of the four-factor solution after Varimax rotation. Factor 1 combined the four *depression* items, with negative loadings for the reversed items and explained 20% (eigenvalue = 3.46) of the total variance. The *anxiety* items loaded substantially on Factor 2 that explained 19 % (eigenvalue = 3.03) of the total variance. The reversed items again showed negative loadings. Factor 3 combined the four *fatigue* items and explained 17 % (eigenvalue = 2.11) of the total variance. Finally, Factor 4 combined the two items that measured *anger* and this factor explained 14 % (eigenvalue = 1.25) of the total variance.

This factor analysis clearly confirmed the dimensionality of the mood items. The 14 items tapped the four *a priori* dimensions: *depression, anxiety, fatigue* and *anger.* On the basis of this analysis the exact mood items were used in the main study.

Table 5.5 *Effort items and Principal - components factor analysis with Varimax rotation*

Effort items	Factor 1	Factor 2	Factor 3
Low effort			
I concentrated on doing simpler jobs	**.80**	-.23	.16
I left some of the most demanding jobs for later	**.76**	.23	-.21
I tried not to ask too much from myself	**.72**	.30	-.01
High effort			
I made a big effort to continue working all day	-.00	**.86**	-.10
I worked very hard in order to overcome problems at work	.21	**.82**	.16
I tried to do everything that I was asked to do	-.03	.04	**.97**
Percentage of variance explained	**18%**	**22%**	**35%**

Response scale for the effort items: 1 (not at all) – 9 (very much)

Finally, principal component analysis with Varimax rotation was performed on the *effort* items used in the pilot study. Six items were chosen to measure effort, with three items representing *low effort* and three items representing *high effort.* The three-factor solution that appeared corresponded to Kaiser's criterion and was based on high communalities. The three-factor solution explained 75 % of the total variance. Factor 1

combined the three items of *low effort* and explained 18 % (eigenvalue = 1.05) of the variance. Factor 2 combined the two of the three measures of *high effort* and explained 22 % (eigenvalue = 1.31) of the variance. Finally, a third factor appeared that explained most of the variance (35 %, eigenvalue = 2.08) and included a single measure of *high effort*. It seemed that this item was measuring something totally different from the *effort* scale. On the basis of this analysis the effort scale was restructured, and the response scale was changed from a nine-point response scale to a four-point frequency-based response scale (1: not at all, 4: very often). In addition, the problematic item was removed and another item was used in order to measure *high effort*. The item "I tried to do everything that I was asked to do" was therefore changed into "I tried very hard in order to continue to work effectively".

5.4.4 Hierarchical Multiple Regression Analysis

In order to test the demand – control model and in particular the interactive hypothesis, hierarchical multiple regression analysis was used. Aiken & West (1991) outline the format for using hierarchical multiple regression. All interactions are first decomposed into main effects. Main effects are entered before interactions in the regression analysis. In order to avoid problematic multicollinearity between first-order terms (demands, resources) and second-order terms (interactions between these independent variables) all variables are standardized before calculating interactions. Due to the lack of power associated with moderated regression analysis (Aiken & West, 1991), the liberal significance criterion of .10 was adopted for report of the findings (Pedhazur, 1982).

Based on the above, the variables were entered into the regression equation in the following order: Demands were entered in the first step of the regression analysis, followed by the resources variable in the second step. In the third step the two-way interaction between demands and resources was entered, in order to test the interaction

hypothesis. Effort has been implicated in the demands literature as an intervening variable that influences both demands and resources. Consequently, it was considered essential to test its relationships with the above variables. Therefore, effort was entered in the fourth step of the equation, in order to test its main effects on the outcome variables. Finally, the 2-way interactions of demands with effort, effort with resources and the 3-way interaction of demands, resources and effort were entered in the fifth step of the equation, allowing us to test these interactive effects as well.

Table 5.6: *Summary of the moderated regression analysis* - ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Demands**	.025	.025	.159***	< .001
2.	**Resources**	.049	.024	.155***	< .001
3.	**Demands x Resources**	.064	.014	.120***	< .001
4.	**Effort**	.123	.059	-.248***	< .001
5.	**Demands x Effort**	.134	.011	-.040*	< .05
	Effort x Resources			.108***	< .001
	Demands x Resources x Effort			.012	ns

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

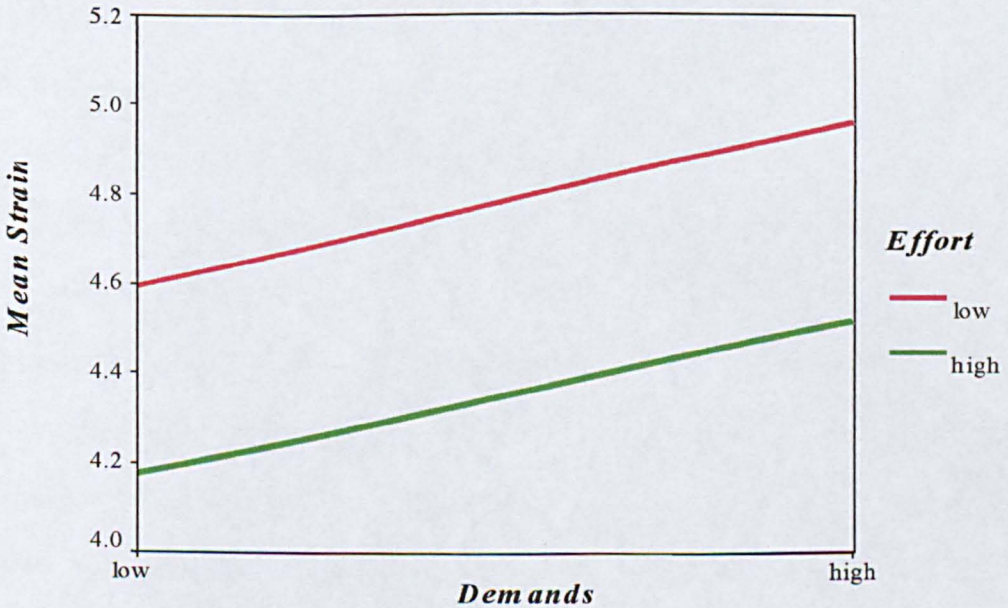

Figure 5.1: Strain as a function of the joint effects of demands and effort

As can be seen on table 5.6 the demands variable accounted for a small but significant 2.5 % of the variance in strain ($\beta = .159$, $F = 65.956$, $p < .001$), indicating that demands increase strain, a finding that was congruent with theory. Furthermore, resources accounted for a significant 2.4 % of the variance in strain ($\beta = .155$, $F = 63.688$, $p < .001$). The sign of the regression coefficient, however, indicates that resources increase strain. This result was unexpected as it postulates harmful effects of control and support to the individual. Looking at the interaction term, it accounted for a very small but significant increase in the variance in *strain* ($\Delta R^2 = .014$, $F = 38.543$, $p < .001$). Rather surprisingly, the sign of the beta coefficient ($\beta = .120$, $p < .001$) indicates that high resources enhance the effects of demands on strain, thus demonstrating an enhancing effect of resources (i.e. a positive interaction). This result will be discussed later on.

In addition, effort accounted for a significant 5.9 % of the variance in strain ($\beta = -.248$, $F = 171.531$, $p < .001$). According to this result, effort has beneficial effects, as it reduces strain. The interaction of demands with effort, resources with effort and the 3-way interaction of demands, resources and effort on strain, accounted for a very small but significant increase in the variance in strain ($\Delta R^2 = .011$, $F = 16.565$, $p < .05$). Looking at the interactions, a significant interactive effect of demands and effort on strain was found ($\beta = -.040$, $p < .05$), indicating that effort reduces the effects of demands on strain. Moreover, a significant interactive effect of resources and effort on strain was shown ($\beta = .107$, $p < .001$). However, the sign of the regression coefficient indicates that effort enhances the effects of resources on strain.

Looking at the Figure 5.1, although the results indicate the presence of an interactive effect, the graph shows not indication of an interaction. This could be due to possible nonlinearity taking place.

Table 5.7: *Summary of the moderated regression analysis – **Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Demands**	.027	.027	.165***	< .001
2.	**Resources**	.036	.009	-.095***	< .001
3.	**Demands x Resources**	.037	.001	-.035†	= .078
4.	**Effort**	.125	.088	-.302***	< .001
5.	**Effort x Demands**	.132	.007	-.035†	= .069
	Effort x Resources			.078***	< .001
	Demands x Resources x Effort			.039†	= .069

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ *** $p < .001$

In the examination of the health complaints variable, demands accounted for a significant almost 2.7 % of the variance in health complaints ($\beta = .165$, $F = 70.683$, $p < .001$), indicating that the demands on the job increase health complaints, thus being consistent with theoretical expectations. Looking at the resources variable, resources also accounted for a very small but significant increase in the variance in health complaints ($\Delta R^2 = .009$, $F = 23.745$, $p < .001$). The sign of the regression coefficient ($\beta = -.095$, $p < .001$) suggests that resources reduce health complaints as expected. The marginally significant interactive effect of demands and resources on health complaints should be mentioned ($\beta = -.035$, $p = .078$), as it suggests that high resources reduce the effects of demands on health complaints, thus demonstrating a suppressing effect of resources and being consistent with theory.

Effort, on the other hand, accounted for a significant 8.8 % of the variance in health complaints ($\beta = -.302$, $F = 253.752$, $p < .001$), indicating that effort is a significant predictor of health complaints. The sign of the regression coefficient demonstrates that effort reduces health complaints. Looking at the interactive effects of demands with effort, resources with effort and the 3-way interaction of demands, resources and effort on health complaints, they accounted for a very small but significant increase in the variance in

health complaints ($\Delta R^2 = .006$, F = 8.494, $p < .001$). A marginally significant interactive effect of demands and effort on health complaints is worth mentioning ($\beta = -.035$, $p = .069$). This finding suggests that effort reduces the effects of demands on health complaints, thus indicating beneficial effects of effort. In addition, a significant interactive effect of resources and effort on health complaints was demonstrated ($\beta = .078$, $p < .001$). This finding was quite surprising as it indicates that the interaction of high resources enhance the effects of effort on health complaints.

Table 5.8: *Summary of the moderated regression analysis – **Effectiveness***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Demands**	.007	.007	-.086***	< .001
2.	**Resources**	.041	.034	.184***	< .001
3.	**Demands x Resources**	.059	.018	-.134***	< .001
4.	**Effort**	.120	.061	.252***	< .001
5.	**Demands x Effort**	.124	.004	.055**	< .01
	Effort x Resources			-.018	ns
	Demands x Resources x Effort			.036	ns

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

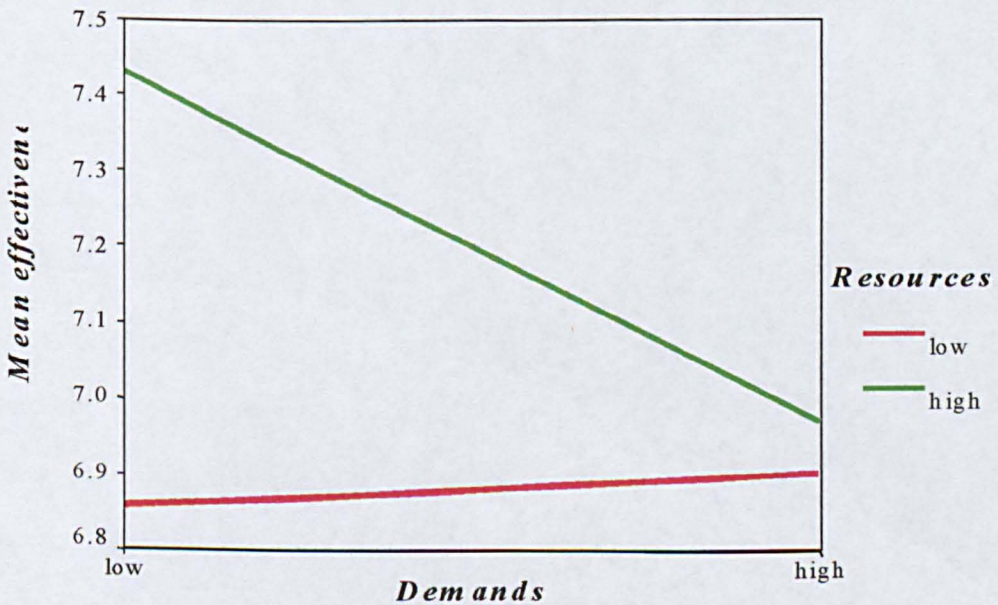

Figure 5.2: Effectiveness as a function of the joint effects of demands and resources

Finally, in the examination of the effectiveness variable, demands accounted for very small but significant increase in the variance in effectiveness ($\Delta R^2 = .007$, F = 18.979, $p < .001$). The regression coefficient ($\beta = -.086, p < .001$) indicates that demands result in a reduction in effectiveness, thus demonstrating negative effects of demands. Furthermore, resources accounted for a significant 3.4 % of the variance in effectiveness ($\beta = .184$, F = 88.632, $p < .001$). According to this result the resources available to the individual increase effectiveness. This finding is congruent with theoretical expectations as beneficial effects of both job control and social support have been well-documented. Moreover, the interaction of *demands* and *resources* accounted for a small but significant variance in *effectiveness* ($\Delta R^2 = .018$, F change = 47.183, $p < .001$). Looking at the sign of the Beta coefficient ($\beta = -.133, p < .001$), it indicates that high resources reduce the effects of demands on effectiveness. This result demonstrates suppressing effects of resources and therefore is consistent with theory.

Looking at the effort variable, effort accounted for a significant 6 % of the variance in effectiveness ($\beta = .250$, F = 173.002, $p < .001$), demonstrating that effort is a predictor of effectiveness. According to the above result, effort increases effectiveness, as expected. Finally, the interactions of demands with effort, resources with effort and the 3-way interaction of demands, resources and effort accounted for a very small but significant variance in effectiveness ($\Delta R^2 = .003$, F = 4.024, $p < .05$). Looking at the regression coefficient ($\beta = .055, p < .01$) of the interaction of demands with effort, the sign of Beta indicates that high effort enhances the effects of demands on effectiveness, thus suggesting an negative impact of effort. Looking at the graph that was plotted, Figure 5.2 illustrates the above-mentioned interactive effects of demands and resources on effectiveness, indicating that high resources suppress the negative impact of demands on effectiveness.

5.5 Discussion

5.5.1 Summary of the findings

In summary, the scales used in the present study reached acceptable levels of reliability and therefore they were retained for the main study. As noted before, the effort scale demonstrated a very low internal consistency (Cronbach's $\alpha = .29$). Consequently, one item of the scale was rewritten and several other items were rephrased in order to reflect more accurately the high and low effort conditions. Correlational analyses revealed small to moderate correlations between the study variables. The majority of the correlations were in the expected theoretical direction. An exception was the direction of the correlation between resources and the outcome variable of strain, indicating that resources increase strain and suggesting negative effects of control and support. This result will be considered below.

The results of the exploratory factor analysis were satisfactory overall. Factor analysis of the mood terms confirmed the dimensionality of the mood items since they tapped the four a priori dimensions. Factor analysis of the work characteristics items revealed 5 factors instead of the a priori 6 dimensions. Both physical demands and problem-solving demands loaded significantly in one factor. Two items that did not load significantly on any of the demands dimensions were modified, as previously noted. Finally, the effort items tapped the two *a priori* dimensions of high and low effort. An exception was the presence of a factor that explained most of the variance (35 %) and measured a single item. The item was subsequently rejected for the main study.

Hierarchical regression analysis was the main statistical procedure employed in the main study as well, as it is considered to be the most appropriate for testing the interactive hypothesis of the demand – control model. Looking at the results of the regression analysis, several of the findings deserve consideration. Statistically significant main effects of demands and resources on all of the outcome variables were observed and most

of them in the hypothesized theoretical direction. Rather unexpectedly, resources were shown to increase strain and this finding will be considered below. In terms of the basic tenet of the demand – control model, the hypothesized interactive effect, two out of the 3 interactions of demands with resources that were tested were statistically significant. However, only one of them was in the expected theoretical direction, thus demonstrating a suppressing effect of resources for the outcome variable of effectiveness. A marginally significant interactive effect of demands and resources on health complaints is worth noting, as it also indicates buffering effects of resources. On the other hand, rather unexpectedly, a positive interaction of demands and resources on strain was found, indicating an enhancing effect of control and support. This surprising finding will be discussed below.

5.5.2 Consideration of the effects of demands and resources

The finding that job demands have detrimental effects on well-being is consistent with a wide literature. High job demands have been found to be significantly correlated with raised levels of anxiety (Billings & Moos, 1982; Payne & Fletcher, 1983), exhaustion (Etzion, 1984) and depression (Billings & Moos, 1982; Warr, 1987). Among nurses, in particular, a number of studies found an association between psychological disorder and job demands (Bourbonnais, Vinet, Meyer & Goldberg, 1992; Bourbonnais, Vinet, Vézina & Gingras, 1992; Fong, 1993; Oehler, Davidson, Starr & Lee, 1991).

Further to the observed main effects of demands, statistically significant main effects of resources were found for all the outcome variables. However, two of the observed effects were congruent with theoretical expectations, indicating beneficial effects of resources on health complaints and effectiveness. These findings are consistent with theory that suggests that both types of resources have beneficial effects on health and well-being. Wickrama *et al.* (1997) note that control contributes to the initiation and

maintenance of health promoting behaviours and the inhibition of health damaging behaviours. Indeed, there is consistent evidence that a high level of job control has positive effects on levels of adjustment, independent of job demands. Research has shown beneficial effects of work control on job satisfaction (Dwyer & Ganster, 1991; McLaney & Hurrell, 1988; Tetrick & LaRocco, 1987), work performance (Greenberger, Strasser, Cummings & Dunham, 1989), psychological well-being (Perrewe & Ganster, 1989; Spector, 1987) and indicators of cardiovascular disease (Karasek, Theorell, Schwartz, Schnall, Pieper & Michela, 1988). In a meta-analysis of the literature, Spector (1986) concludes that worker control is positively correlated with high levels of worker satisfaction, involvement, commitment, and motivation and low levels of physical complaints.

Control also affects continued employment in situations where workers are chronically ill or have a disability. For example, Yelin (1986) found that among workers with a chronic illness, those in work situations that involved a high degree of control were twice as likely to remain on the job as those with low control.

The observed beneficial effects of support coincide with the view of several researchers suggesting that social support has a general direct or main effect, bolstering a person's capacity to withstand stress and thus lessening the intensity of stressful situations (House, 1981). There is prevalent agreement that the presence of positive social relationships is associated with an improvement of the individual's health and well-being (Cohen & Wills, 1985; LaRocco, House & French, 1980). Many studies have linked social support with high levels of job satisfaction (Jackson, 1983), reduction in depression (Lin and Ensel, 1984), thus demonstrating its positive impact on the individual's well-being. In the nursing profession, research has consistently demonstrated a negative association between social support and psychological disorders (Browner, 1987; Ogus, 1990; Revicki

& May, 1989; Singh, 1990). De Jonge *et al.* (1996) reported that a high amount of job-related support reduced feelings of exhaustion among health care professionals.

A final comment the above findings should be made. The finding that resources in the form of control and support, accounted for a statistically significant variance in strain, minor health complaints and effectiveness, reinforces the view that control and support factors are important determinants of how people respond to stressors.

In conclusion, the observed main effects supported an additive demand – control model which is a common finding in studies involving relatively homogeneous samples (Hurrell & McLaney, 1989).

Contrary to expectations, the results indicated a detrimental main effect of resources on strain and an enhancing effect of resources for the same outcome variable. We can only speculate as to the reasons for the above findings.

One reason that may account for the enhancing effects of resources has been put forward by Schaubroeck & Fink (1998). They assert that although both job control and social support are positive contributors to well-being, whether control or support has positive effects on the outcomes may depend on the level of support and control respectively. Jobs with low control may be particularly suitable for the effective provision of supervisor and co-worker support. It is when the individual feels that he or she has low personal control that he or she will turn to the co-workers or the supervisor for their help in order to maintain an effective performance. Conversely, workers that do have high control do not require support for effective job performance. In this case support may even operate as a nuisance as it would require reciprocation that may undermine their performance. Consistent with these assumptions, Landbergis *et al.* (1992) found that job demands were positively related to job dissatisfaction only in high control, low support conditions.

Another view that may account for the detrimental and enhancing effects of resources has to do with individual differences. In particular, it has been asserted that individuals with an internal locus of control are more likely to cope actively with job stress, whereas those with an external locus of control are more likely to refrain from action since they believe that changing the situation is beyond their power. Consistent with the previous reasoning, it has been argued that control is only likely to have a beneficial effect for individuals with an internal locus of control (Daniels & Guppy, 1994; Frese, 1989). In a similar vein, Parkes (1989) has pointed out that control is more likely to be perceived as beneficial when objective control is high and the employee's locus of control is internal. Rodriguez *et al.* (2001) found that, apart from social support, locus of control also plays a significant role in bringing about a beneficial or detrimental effect of job control. Finally, de Rijk, LeBlanc, Schaufeli & de Jonge (1998) found that a misfit between the experienced level of control and individual coping style intensified the stress-enhancing experience of job demands.

Looking specifically at the enhancing effects of support, Depaulo, Brown, Ishii & Fisher (1981) indicated that, under some conditions, social support might obstruct optimal functioning. In particular, the type of support provided by supervisors and coworkers may sometimes be intrusive, ill-timed or poorly matched to what is needed and this might result in negative instead of positive effects. Sandler & Lakey (1982) found that locus of control affected the receipt and impact of social support among a group of 93 college students. Their findings indicated that although the individuals with an external locus of control received a higher quantity of social support, the individuals with an internal locus of control obtained a stress-buffering effect from social support. They hypothesise that "internals" may be able to utilize the assistance provided more effectively than "externals" and conclude that locus of control influences how individuals make use of the potential social supports. Theorists such as Liang & Bogat (1994) echo these thoughts, suggesting

that self confident individuals with better social skills are better able to establish and utilize support networks and that locus of control moderates social support utilization during stressful times.

Metts (1998) asserts that only if social support facilitates the individual's ability to cope with stress, it should be considered as being beneficial. In support of the above view, Cutrona & Russell (1990) observed that if support does not match the needs of the recipient, it may not alleviate the problem. Additionally, it has been noted that certain types of social support may qualify as "control" or "advice" behaviors and in that way they inhibit autonomous functioning of the individual, resulting in negative rather than positive effects (Cutrona & Suhr, 1994).

The heart of the demand – control model is the interaction between job demands and job control. The presence of an interaction substantiates the core effects of high demands and low control. The findings of the present pilot study, however, provided limited support for the interactive hypothesis, indicating some counterintuitive results as well.

5.5.3 Consideration of the effects of effort

Looking at the effects of effort, this variable was found to be associated with reduced strain and health complaints and increased effectiveness, indicating a beneficial effect of effort. Consistent with the above result, a suppressing effect of effort on demands was observed for the outcome variables of strain and health complaints. On the other hand, an enhancing effect of effort on demands was demonstrated for the outcome variable of effectiveness. These findings will be briefly discussed below.

The positive impact of effort on the outcome variables suggests that the individuals were operating on an engagement mode of demand management (Hockey, 2000). The above involves the application of direct, active coping within the limits of the individual.

This mode protects performance under demands and is characterized by active engagement of the individuals with their work task. Mostly positive feelings are associated with this "effortful coping" (Lundberg & Frankenhaeuser, 1980; Meijman & Mulder, 1998) and increases in adrenaline and nonadrenaline are also observed. Frankehaeuser (1986), in her analysis of coping patterns, labeled this as "effort without distress" and asserted that it mostly fits challenging situations. In a study of two junior doctors, Hockey *et al.* (1996) found that this kind of coping is associated with work that is characterized by high demands and high resources.

Essentially, expending effort yields short-term reactions. These are responses of the adaptive mechanisms of the individual and involve changes in the physiological and psychological level. Specifically, at the physiological level, an increase in adrenaline, a hormone that is involved in the activation of the individual, is observed. At the mental level, changes in mood or motivations may be observed. These reactions are in principle reversible via the process of recovery. The concept of recovery is of primal importance in the examination of work stress and well-being, since the impossibility to recover may turn these short-term reactions into negative load effects and subsequently into possible impairment and illness in the long term (Meijman & Mulder, 1998).

As previously noted, daily work may involve demands that when measured at a certain moment do not exceed a minimum level of harmfulness. However, their daily reoccurrence makes them a continued source of tension that may have long-term negative effects. This is dependent on the opportunities for recovery after successive periods of exposure (Meijman & Mulder, 1998).

A further point is worth mentioning. Although the choice of coping mode facilitates the adjustment to adverse environmental conditions, it should not only seek to improve performance goals, but also to fulfill the individual's need to satisfy personal goals and to maintain a sufficient state of well-being. While individuals have considerable

flexibility in the choice of their coping mode through the process of control, many work environments encourage the adoption of direct coping since they are intolerant of errors and of slow rates of work (Hockey, 2000). One such work environment is the hospital and this further supports the findings indicating the operation of the mode of active, direct coping in our sample of nurses.

5.5.4 Conclusion

Overall, the findings of the present pilot study offered promising results. Main effects were consistently found, thus offering partial support of an additive demand – control model in the present study. On the other hand, two interactive effects were also found, indicating suppressing and enhancing effects of resources. A consistent main effect of resources indicating an enhancing function was the most unexpected finding, but this is not totally surprising, particularly in the area of health care (see discussion in chapter 6).

CHAPTER 6

BETWEEN- INDIVIDUALS ANALYSIS OF THE CROSS-SECTIONAL DATA

6.1 General Introduction

Our focus in the present study was the examination of the demand – control model in both a cross-sectional and a longitudinal framework, using a structured diary methodology and dynamic within-person analyses. As was discussed in section 3.3, the diaries capture significant variation in the microprocesses underlying health and well-being. A diary methodology can therefore be conceived as a multi-wave longitudinal study in the microlevel allowing intensive longitudinal assessments with each day of diary completion. Diaries additionally minimise recall biases and depict dynamic relationships between the variables under examination. More fundamentally, due to the richness of data they yield, they allow the use of different analytic approaches, more powerful and reliable than the conventional between-subjects design.

The focus of the present chapter is to assess the demand – control model cross-sectionally, using two different analytic procedures.

The more conventional approach for testing the demand-control model – and the most commonly used by other studies that examine the model – involved cross-sectional analysis of the questionnaire data. The questionnaires entail assessment on a single occasion, thus do not account for problems of retrospective recall. On the other hand, the particular advantage of the questionnaire used is that it contains scales with established psychometric properties and well-validated new scales, therefore it is considered a reliable instrument.

An alternative analytic approach is to attempt to test the demand – control model using more stable measures of the predictor and outcome variables, an individual's average measure aggregated over the diary completion period (Eckenrode, 1984). Here the research question shifts to the prediction of average levels of strain, health complaints and effectiveness. As previously described, a reason for aggregating observations over time is to obtain more stable and reliable measures of variables that can be measured on a continuous basis. When these measures are averaged over several days, error associated with day-to-day situational variability tends to be reduced, yielding more stable measures that represent the typical or average psychological state or behaviour of the individual. Temporal aggregation of observations has been advocated as a useful measure for bridging idiographic and nomothetic approaches in personality research (Epstein, 1979, 1980; Rushton, Jackson & Paunonen, 1981). Based on the above, the present study sought to assess the demand – control model using daily reports of demands, resources, effort and the outcome variables, averaged over the 24 diary completion days. Temporally aggregated measures should be more reliable than single observations and more valid than retrospective recall data because they minimise errors of recall (Verbrugge, 1980).

In the present chapter, both the diary data and the questionnaire data were used to perform cross-sectional between-individuals analyses. A third analytic procedure involving cross-sectional within-individual analysis was performed on the diary data, and this will be described in detail in chapter 7.

6.2 Data analytic procedures

The questionnaire data were analysed with the conventional between-individuals cross-sectional analysis. The first analytic procedure that was carried out on the diary data

involved constructing average measures of the relevant study variables over the 24 diary completion days in order to establish reliable means for each individual. This is a standard approach in which the individual respondent is taken as the unit of analysis. The averages across the 24 diary completion days for each individual can be found in appendix 2.

6.3 Main statistical analyses

The main statistical analyses employed in the present study are correlational analysis and hierarchical moderated regression analysis. Both these procedures will be considered below.

6.3.1 *Correlational analysis*

Correlations were computed separately for each data set on both waves. The correlation matrices show the means, standard deviations and intercorrelations of the study variables. For the diary data *emotional demands, mental demands, problem-solving demands* and *physical demands* were combined to produce a single measure of *job demands*. In addition, *control* and *social support* measures were combined to represent a higher order buffering factor, which has been called *resources* (Hockey et al., 1996). Similarly, *anxiety, anger, depression* and *fatigue* were combined to produce one measure of *strain*.

For the questionnaire data, *cognitive demands, monitoring demands, responsibility demands, emotional demands* and *physical demands* were combined to produce a single measure of *job demands*. Similarly, *timing control, method control* and *social support* were combined in a single measure representing the *resources* available to the individual. As for

the diary data, the separate strain measures of *anxiety, anger, depression* and *fatigue* were averaged to provide an overall index of *strain.*

6.3.2 Hierarchical Moderated Regression analysis

Hierarchical moderated regression was the main statistical technique used in this study. This procedure has been recommended as the most appropriate method for testing main effects and interactions when independent measures are continuous (Bromet *et al.*, 1988; Cohen & Cohen, 1983; Parkes, 1991). In addition, it has been argued that moderating effects ideally should be tested with moderated regression analysis (Aiken & West, 1991; Landsbergis *et al.* 1994). To test for interaction terms, a hierarchical regression model was developed in which the independent variables were entered in a predetermined sequence so that "terms of lower order are partialled out from those of higher order and not vice versa" (Cohen, 1978). Interaction terms were entered after main effects. The interaction was carried by the product of all constituent variables (Cohen & Cohen, 1983).

However, since the interaction term is a combination of two independent variables, the risk of multicollinearity is very high. In order to reduce this risk, moderated regression analyses was conducted on the standardised scores of the independent variables (Jaccard, Turrisi & Wan, 1990). The interaction term built from the standard scores has a much lower correlation with the independent variables than the interaction term built from the non-standard scores (Carayon, 1993).

The variable of marital status was dummy coded (n -1) before it was entered in the regression equation. This initially discrete variable was converted into a set of dichotomous variables, coding them with 1s and 0s. The new dichotomous variables are

then entered into regression as a group (as recommended by Fox, 1991) and in this way both the variance due to the original discrete independent variable is analysed and the effect of the newly created dichotomous components was examined as well (Tabachnick & Fidell, 2001).

The regression procedure was carried out in seven steps. The first and second step involved controlling for background variables. Thus, in the first step of the analysis, the background variable of age was entered in order to control for its effects. In the second step, the variable of marital status (n -1 dummy coded) was entered. For the test of the demand – control model, the main effect of demands was entered in the third step, followed by the main effect of resources in the fourth step, and the demand x resources interaction in the fifth step.

Effort was entered in the sixth step of the regression equation in order to test its effects on the outcome variables. As was previously discussed, effort has been implicated as an intervening variable in the regulation of job demands. Finally, the 2-way interactions of demands with effort and effort with resources and the 3-way interaction of demands with resources with effort were entered, in order to explore these relationships as well.

6.4 Graphs

Demands, resources and effort were classified into two levels, high and low demands, high and low resources and high and low effort, after calculating the median for each variable. In order to assess whether the interaction effects were of the hypothesised form, the form of the interaction was plotted. As for the multivariate moderated regression analysis, all the predictor variables were standardised before calculating the interaction term in order to reduce collinearity, but the unstandardised scale scores for the dependent

variables were retained in order to provide a clearer indication of the meaning of the effects (Payne, Wall, Borrill & Carter, 1999).

6.5 (a) Questionnaires - Wave 1

The analyses were carried out on the 421 individuals that completed the questionnaires in wave 1.

6.5.1 (a) Correlation analysis

Table 6.1: Descriptive statistics and correlation matrix of the variables – ***Questionnaires*** – (n = 421)

Variables	*Mean*	*SD*	*DEM*	*RES*	*EFR*	*STR*	*HC*	*JSAT*
Age	34.4	6.9						
Married	66							
Single	31							
Divorced	1.4							
Demands (DEM)	4.01	.50						
Resources (RES)	3.21	.67	.26**					
Effort (EFR)	2.81	.49	.14**	-.02				
Strain (STR)	4.23	1.25	.03	-.29**	-.16**			
Health complaints (HC)	.62	.38	-.01	-.07	-.10*	.44**		
Job satisfaction (JSAT)	4.42	1.0	.05	.42**	.12*	-.44**	-.18**	
GHQ	2.05	.51	-.07	-.15**	-.18**	.50**	.41**	-.31**

Note: For dichotomous variables the percentages are given and for numerical variables the means, SD and product moment correlation coefficients are given.
*$p < .05$, **$p < .01$

Looking at the table above, there are several features of the zero-order correlations that are of interest. Overall, quite unpredictably, the demands measures did not correlate with any of the outcome variables. Resources, on the other hand, showed moderate negative correlations with strain ($r = -.29, p < .01$) and GHQ ($r = -.15, p < .01$) and a rather

strong positive correlation with job satisfaction ($r = .42, p < .01$). A statistically significant correlation of effort with demands was observed, as expected ($r = .15, p < .01$), indicating that as job demands increase, effort increases as well. Moreover, effort showed small negative correlations with strain ($r = -.16, p < .01$), health complaints ($r = -.10, p < .05$) and GHQ ($r = -.18, p < .01$) and a moderate positive correlation with job satisfaction ($r = .12, p < .05$), thus indicating beneficial effects of effort.

6.5.2 (a) Regression analysis

Table 6.2: Summary of the moderated regression analysis – Questionnaires (a) – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.001	.001	-.024	ns
2.	**Married**	.006	.005	-.125	ns
	Single			-.152	ns
	Divorced			.019	ns
3.	**Demands**	.007	.001	.031	ns
4.	**Resources**	.107	.100	-.333***	< .001
5.	**Demands x Resources**	.113	.006	-.079	ns
6.	**Effort**	.143	.030	-.178***	< .001
7.	**Demands x Effort**	.147	.004	-.008	ns
	Effort x Resources			-.045	ns
	Demands x Resources x Effort			.055	ns

Note: the Table shows standardised β weights for each step of the analysis.
*** $p < .001$

As can be seen from Table 6.3, the background variables of age and marital status have no significant effect on strain. Similarly, there was no significant main effect of demands on strain. However, resources were found to account for a small but significant 1 % of the variance in strain ($\beta = -.333$, $F = 46.071$, $p < .001$). Rather unexpectedly, the interaction of job demands and resources did not account for a significant variance in strain.

Effort, on the other hand, accounted for a significant 3 % of the variance in strain (β = -.178, F = 14.489, $p < .001$). Finally, the interaction of effort with demands, the interaction of effort with support and the three-way interaction of demands, resources and effort were not found to be major predictors of strain.

Table 6.3: Summary of the moderated regression analysis – Questionnaires (a) – ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.000	.000	-.015	ns
2.	**Married**	.010	.010	.152	ns
	Single			.044	ns
	Divorced			.018	ns
3.	**Demands**	.010	.000	-.008	ns
4.	**Resources**	.015	.004	-.070	ns
5.	**Demands x Resources**	.016	.001	.028	ns
6.	**Effort**	.028	.013	-.115*	< .05
7.	**Demands x Effort**	.029	.001	.007	ns
	Effort x Resources			-.034	ns
	Demands x Resources x Effort			.005	ns

Note: the Table shows standardised β weights for each step of the analysis.
* $p < .05$

Examining the health complaints variable, the demographic variables of age and marital status, accounted for only 1 % of the variance in health complaints. Similarly, demands and resources did not have any significant effect on health complaints. In addition, the interaction of demands and resources did not predict health complaints. Effort, on the other hand, accounted for a small but significant 1.3 % of the variance in health complaints (β = -.115, F = 5.372, $p < .05$), indicating a positive impact of effort. Finally, the interactions of effort with demands, effort with resources and the 3-way interaction of demands, resources and effort, did not have any significant effects on health complaints.

Table 6.4: Summary of the moderated regression analysis – Questionnaires (a) – ***Job satisfaction***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.000	.000	.018	ns
2.	**Married**	.006	.006	-.054	ns
	Single			.037	ns
	Divorced			-.018	ns
3.	**Demands**	.009	.002	.048	ns
4.	**Resources**	.184	.175	.441***	< .001
5.	**Demands x Resources**	.185	.000	.020	ns
6.	**Effort**	.205	.020	.145**	< .01
7.	**Demands x Effort**	.207	.002	-.020	ns
	Effort x Resources			.042	ns
	Demands x Resources x Effort			.021	ns

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

In the examination of the job satisfaction variable, age, marital status and demands did not account for a significant increase in the variance in job satisfaction. Resources, on the other hand, account for a significant 17.5 % of the variance in job satisfaction ($\beta = .441$, $F = 88.478$, $p < .001$), demonstrating that resources are a major predictor of job satisfaction, a finding that coincides with theory.

Surprisingly, the interaction of demands and resources was not did not account for any significant increase in the variance in job satisfaction. On the other hand, effort accounted for a small but significant 2 % of the variance in job satisfaction ($\beta = .145$, $F = 10.396$, $p < .01$), indicating beneficial effects of effort.

Table 6.5: Summary of the moderated regression analysis – Questionnaires (a) – ***GHQ***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.000	.000	-.012	ns
2.	**Married**	.020	.020	-.354**	< .01
	Single			-.379**	< .01
	Divorced			-.124*	< .05
3.	**Demands**	.026	.006	-.079	ns
4.	**Resources**	.049	.023	-.160**	< .01
5.	**Demands x Resources**	.050	.001	-.030	ns
6.	**Effort**	.082	.032	-.183***	< .001
7.	**Demands x Effort**	.089	.007	.008	ns
	Effort x Resources			-.066	ns
	Demands x Resources x Effort			-.046	ns

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

In the examination of the GHQ variable, again the controlled background variable of age did not have any significant effect on GHQ scores. The background variable of marital status, however, accounted for a small but significant increase in the variance in GHQ scores ($\Delta R^2 = .020$, $F = 2.776$, $p < .05$). However, as previously mentioned, the effect of the above variable has been controlled for. Resources accounted for a significant 2.3 % of the variance in *GHQ* scores ($\beta = -.160$, $F = 10.049$, $p < .01$), as was expected from theory. In addition, effort accounted for a significant 3.2 % of the variance in *GHQ* ($\beta = -.183$, $F = 14.409$, $p < .001$), indicating beneficial effects of effort. The implications of this important finding will be discussed later on.

6.5.3 (a) Summary of wave 1 questionnaire analysis

Looking at the results of the regression analysis on the questionnaire data from wave 1, there were no statistically significant interactive effects. In terms of main effects,

only main effects of resources on three out of the four outcome variables were observed and all of these were in the expected theoretical direction, indicating beneficial effects of resources. Further statistically significant main effects of effort on all the outcome variables were found. Effort was associated with a reduction in strain, health complaints and GHQ scores and an increase in job satisfaction. The above demonstrates positive impact of effort on the individual's well-being.

6.5 (b) Questionnaires – Wave 1

In order to check the stability of the results, the 168 individuals that did not complete the questionnaires in the second wave were removed and the same analysis was conducted on the 254 people that had completed the questionnaire in both waves. The results of this second analysis will be reported briefly below.

6.5.1 (b) Correlation analysis

Table 6.6: Descriptive statistics and correlation matrix of the variables – ***Questionnaires*** – (n = 254)

Variables	*Mean*	*SD*	*DEM*	*RES*	*EFRT*	*STR*	*HC*	*JSAT*
Age	34.7	7.23						
Married	63.4							
Single	31.5							
Divorced	1.6							
Demands (DEM)	4.02	.53						
Resources (RES)	3.25	.68	.32**					
Effort (EFRT)	2.79	.53	.09	.03				
Strain (STR)	4.18	1.30	.01	-.30**	-.25**			
Health complaints (HC)	.60	.37	-.03	-.14*	-.21**	.49**		
Job satisfaction (JSAT)	4.51	.98	.08	.41**	.17**	-.48**	-.27**	
GHQ	2.06	.54	-.07	-.14*	-.27**	.53**	.38**	-.33**

Note: For dichotomous variables the percentages are given and for numerical variables the means, SD and product moment correlation coefficients are given.
* $p < .05$, ** $p < .01$

As can be seen from the table, demands did not correlate with any of the outcome variables. They only showed a moderate positive correlation with resources ($r = .32, p < .01$), indicating that job demands are linked to increased control and support. On the other hand, resources showed moderate to strong correlations with all the outcome variables. Specifically, negative correlations of resources with strain ($r = -.30, p < .01$), health complaints ($r = -.14, p < .05$) and GHQ scores ($r = -.14, p < .05$) and a strong positive correlation of resources with job satisfaction ($r = .41, p < .01$) was found, as expected. Effort, correlated strongly with all the outcome variables. In particular, effort was found to have moderate negative correlations with strain ($r = -.25, p < .01$), health complaints ($r = -.21, p < .01$) and GHQ scores ($r = -.27, p < .01$), and a positive correlation with job satisfaction ($r = .17, p < .01$), thus suggesting beneficial effects of effort.

6.5.2 (b) Regression analysis

Table 6.7: Summary of the moderated regression analysis – Questionnaires (b) – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.005	.005	-.069	ns
2.	**Married**	.015	.011	-.041	ns
	Single			-.135	ns
	Divorced			.044	ns
3.	**Demands**	.015	.000	-.001	ns
4.	**Resources**	.111	.096	-.338***	< .001
5.	**Demands x Resources**	.114	.002	-.048	ns
6.	**Effort**	.171	.058	-.242***	< .001
7.	**Demands x Effort**	.195	.024	.016	ns
	Effort x Resources			-.135*	< .05
	Demands x Resources x Effort			.174*	< .05

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

In the examination of the strain variable, age, marital status and demands did not have any effect on strain. This finding coincides with the one of the previous analysis. On the other hand, resources accounted for a significant 9.6 % of the variance in strain (β = -.338, F = 26.697, $p < .001$), as was expected. Moreover, effort accounted for 5.8 % of the variance in strain (β = -.242, F = 17.006, $p < .001$), indicating that effort is associated with a reduction in strain.

Of interest is the significant interactive effect of resources and effort on strain (β = -.135, $p < .05$), suggesting that high resources reduce the effects of effort on strain, thus demonstrating a suppressing effect of resources. In addition, a significant interactive effect of demands, resources and effort on strain was found (β = .174, $p < .05$). Surprisingly, this finding indicates high resources and effort enhance the effects of demands on strain and this will be considered later on.

Table 6.8: Summary of the moderated regression analysis – Questionnaires (b) – ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.007	.007	-.085	ns
2.	**Married**	.017	.010	.167	ns
	Single			.153	ns
	Divorced			.116	ns
3.	**Demands**	.018	.001	-.033	ns
4.	**Resources**	.030	.012	-.118	ns
5.	**Demands x Resources**	.030	.001	.026	ns
6.	**Effort**	.073	.042	-.208**	< .01
7.	**Demands x Effort**	.079	.006	.057	ns
	Effort x Resources			.050	ns
	Demands x Resources x Effort			-.035	ns

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

Examining the health complaints variable, age and marital status, demands and resources did not have any effect on health complaints. Surprisingly, no significant interactive effects of demands and resources on health complaints were observed, a finding that is similar to the one of the previous analyses. Effort, on the other hand, accounted for a significant 4.2 % of the variance in health complaints ($\beta = -.208$, $F = 11.173$, $p < .01$), indicating a positive impact of effort on health complaints. This result was reported in the previous analysis. Finally, looking at the interactions of effort with demands, effort with resources and the 3-way interaction of demands, resources and effort, no significant effect on health complaints was found, as before.

Table 6.9: Summary of the moderated regression analysis – Questionnaires (b) – ***Job satisfaction***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.000	.000	.002	ns
2.	**Married**	.024	.024	-.212	ns
	Single			-.040	ns
	Divorced			-.036	ns
3.	**Demands**	.033	.009	.094	ns
4.	**Resources**	.187	.154	.428***	< .001
5.	**Demands x Resources**	.192	.005	-.076	ns
6.	**Effort**	.220	.028	.168**	< .01
7.	**Demands x Effort**	.228	.008	-.003	ns
	Effort x Resources			.090	ns
	Demands x Resources x Effort			-.085	ns

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

In the examination of the job satisfaction variable, age, marital status and job demands did not account for any significant increase in the variance in job satisfaction. This finding is consistent with the one of the previous analysis. On the other hand,

resources accounted for a significant 15.4 % of the variance in job satisfaction ($\beta = .428$, $F = 46.813$, $p < .001$), suggesting, as expected, that resources are a major predictor of job satisfaction.

Rather unexpectedly, there were no significant interactive effects between demands with resources on job satisfaction, as previously found. Effort accounted for a small but significant 2.8 % of the variance in job satisfaction ($\beta = .168$, $F = 8.703$, $p < .01$) a result that was consistent with the one of the previous analysis. Finally, the interactions of effort with demands, effort with resources and the three-way interaction of demands, resources and effort did not have any effect on job satisfaction and this coincided with the result of the previous analysis.

Table 6.10: Summary of the moderated regression analysis – Questionnaires (b) – ***GHQ***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.005	.005	-.067	ns
2.	**Married**	.056	.052	-.562***	< .001
	Single			-.589***	< .001
	Divorced			-.182*	< .05
3.	**Demands**	.062	.006	-.075	ns
4.	**Resources**	.086	.024	-.170*	< .05
5.	**Demands x Resources**	.086	.000	.001	ns
6.	**Effort**	.150	.064	-.255***	< .001
7.	**Demands x Effort**	.159	.009	-.007	ns
	Effort x Resources			-.096	ns
	Demands x Resources x Effort			-.003	ns

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

Finally, in the examination of GHQ, age did not have any significant effect on GHQ scores. Marital status, on the other hand, accounted for a significant increase in the variance

in GHQ scores ($\Delta R^2 = .052$, F change = 4.562, $p < .01$), as reported in the previous analysis as well. However, the effects of age and marital status have already been controlled for. Demands, on the other hand, did not have any significant effect on GHQ scores and this result coincides with the one previously found. Furthermore, resources accounted for a small but significant 2.4 % of the variance in GHQ scores ($\beta = -.170$, F = 6.539, $p < .05$), a result is consistent with the one of the previous analysis.

The interaction of demands and resources did not have any effect on GHQ scores. Effort, however, accounted for a significant 6 % of the variance in GHQ scores ($\beta = -.255$, F = 18.372, $p < .001$) indicating that effort was associated with a reduction in psychological distress, a result with again coincides with the one of the previous analysis. Finally, the interactions of effort with demands, effort with resources and the 3-way interaction of demands, resources and effort did not have any effect on GHQ scores.

6.5.3 (b) Summary of wave 1 questionnaire analysis

When the regression analysis was repeated on the questionnaire data of wave 1 but only for the individuals that completed the questionnaires on both waves, after removing the individuals that did not complete the questionnaires in wave 2, the results were very similar. Main effects of resources and effort on the same outcome variables were observed, as before. An additional interesting finding, however, was the statistically significant interactive effects of effort and resources on strain, suggesting a suppressing effect of resources, as expected. Moreover, a statistically significant interactive effect of demands, resources and effort on strain was found. However, the direction of the interaction indicated an enhancing effect of resources and effort.

6.6 Questionnaires - Wave 2

Correlation and regression analyses were conducted on the 255 individuals that completed the questionnaire on the second wave.

6.6.1 Correlation analysis

Table 6.11: Descriptive statistics and correlation matrix of the variables – ***Questionnaires*** – (n = 255)

Variables	*Mean*	*SD*	*DEM*	*RES*	*EFRT*	*STR*	*HC*	*JSAT*
Age								
Married								
Single								
Divorced								
Demands (DEM)	3.98	.42						
Resources (RES)	3.32	.56	.17**					
Effort (EFRT)	2.74	.50	.03	-.04				
Strain (STR)	4.06	1.15	.09	-.32**	-.11			
Health complaints (HC)	.59	.27	.13*	-.18**	.02	.36**		
Job satisfaction (JSAT)	4.62	.95	-.05	.39**	.10	-.52**	-.32**	
GHQ	2.05	.55	-.03	-.13*	-.11	.42**	.30**	-.19**

Note: For dichotomous variables the percentages are given and for numerical variables the means, SD and product moment correlation coefficients are given.
*$p < .05$, **, $p < .01$

Looking at the correlation matrix above, demands correlated with only one of the outcome variables. Specifically, a small positive correlation of demands with health complaints ($r = .13$, $p < .05$) was found. An unexpected finding is the lack of correlation between demands and effort. On the other hand, resources showed moderate to strong correlations with all of the outcome variables and in the expected theoretical direction. Effort did not have any significant correlations with any of the outcome variables.

Finally, all the outcome variables were strongly intercorrelated and all in the direction hypothesised.

6.6.2 Regression analysis

Table 6.12: Summary of the moderated regression analysis – Questionnaires (Wave 2) – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.003	.003	-.054	ns
2.	**Married**	.009	.003	-.130	ns
	Single			-.165	ns
	Divorced			-.006	ns
3.	**Demands**	.015	.006	.080	ns
4.	**Resources**	.122	.107	-.339***	< .001
5.	**Demands x Resources**	.129	.007	-.084	ns
6.	**Effort**	.144	.015	-.122*	< .05
7.	**Demands x Effort**	.178	.034	.020	ns
	Effort x Resources			-.197**	< .01
	Demands x Resources x Effort			.127	ns

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

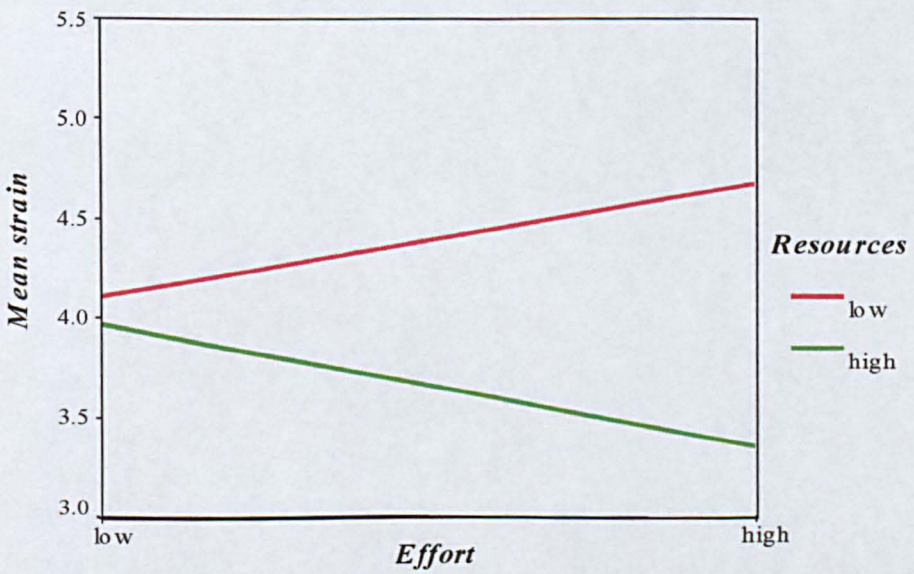

Figure 6.1: Strain as a function of joint effects of effort and resources – Wave 2

Looking at table 6.12, the background variables of age and marital status and demands did not have any significant effect on strain. Resources, on the other hand, accounted for a significant 10.7 % of the variance in strain ($\beta = -.339$, $F = 30.044$, $p < .001$). This result is congruent with theoretical expectations as it indicates that the resources that are available to the individual enable him to experience less strain. In addition, effort accounted for a small but significant 1.5 % of the variance in strain ($\beta = -.122$, $F = 4.150$, $p < .05$), indicating a beneficial effect of effort. Finally, the interactions of effort with demands, effort with resources and demands, resources and effort accounted for a significant increase in the variance in strain ($\Delta R^2 = .034$, $F = 3.371$, $p < .05$). Significant interactive effects of effort and resources on strain were found ($\beta = -.197$, $p < .01$), implying that high resources reduce the effects of effort on strain, thus demonstrating a buffering effect of resources. Figure 6.1 illustrates a reduction in the effort – strain slope as resources increase from low to high, as is indicated in the findings.

Table 6.13: Summary of the moderated regression analysis –Questionnaires (Wave 2)– ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.000	.000	-.001	ns
2.	**Married**	.010	.010	-.120	ns
	Single			-.178	ns
	Divorced			.019	ns
3.	**Demands**	.023	.013	.116	ns
4.	**Resources**	.061	.038	-.203**	< .01
5.	**Demands x Resources**	.073	.012	-.110	ns
6.	**Effort**	.073	.000	.015	ns
7.	**Demands x Effort**	.078	.005	.076	ns
	Effort x Resources			-.009	ns
	Demands x Resources x Effort			.015	ns

Note: the Table shows standardised β weights for each step of the analysis.
** $p < .01$

In the examination of the health complaints variable, there were no significant effects of the background variables of age and marital status on health complaints. Similarly, no significant main effect of demands on health complaints was found. Resources, on the other hand, accounted for a small but significant 4 % of the variance in health complaints ($\beta = -.203$, $F = 10.085$, $p < .01$), in the expected theoretical direction, indicating beneficial effects of resources.

Table 6.14: Summary of the moderated regression analysis – Questionnaires (Wave 2) – ***Job satisfaction***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.010	.010	.099	ns
2.	**Married**	.047	.038	.302*	< .05
	Single			.395**	< .01
	Divorced			.153*	< .05
3.	**Demands**	.048	.001	-.033	ns
4.	**Resources**	.193	.144	.394***	< .001
5.	**Demands x Resources**	.201	.008	.093	ns
6.	**Effort**	.213	.012	.110	ns
7.	**Demands x Effort**	.234	.022	.068	ns
	Effort x Resources			.125	ns
	Demands x Resources x Effort			-.068	ns

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

In the examination of job satisfaction, the background variable of age did not have any significant effect on job satisfaction. Marital status, on the other hand, accounted for a significant 3.8 % of the variance in job satisfaction ($\beta = .302$, $F = 3.268$, $p < .05$). However, the effects of this background variable have already been controlled for. Demands, on the other hand, did not have any significant main effect on job satisfaction. Resources, however, accounted for a significant 14 % of the variance in job satisfaction ($\beta = .394$, $F = 44.114$, $p <$

.001) suggesting that the resources available to the individual are a major predictor of job satisfaction. The above finding is consistent with theory as it indicates that both control and social support increase job satisfaction.

Table 6.15: Summary of the moderated regression analysis – Questionnaires (Wave 2) – ***GHQ***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.007	.007	-.082	ns
2.	**Married**	.015	.008	.162	ns
	Single			.155	ns
	Divorced			-.016	ns
3.	**Demands**	.015	.000	-.015	ns
4.	**Resources**	.032	.017	-.135*	< .05
5.	**Demands x Resources**	.037	.004	-.067	ns
6.	**Effort**	.050	.013	-.116	ns
7.	**Demands x Effort**	.062	.012	-.077	ns
	Effort x Resources			-.063	ns
	Demands x Resources x Effort			.052	ns

Note: the Table shows standardised β weights for each step of the analysis.
*$p < .05$

The background variables of age and marital status did not have any significant effect on GHQ scores. Similarly, demands did not have any significant effect on GHQ scores. Resources, on the other hand, accounted for a small but significant 1.7 % of the variance in GHQ scores ($\beta = -.135$, $F = 4.344$, $p < .05$), indicating that resources reduce psychological distress, a finding that is consistent with theory and will be discussed. Rather unexpectedly, no significant interactive effect of demands and resources on GHQ scores was found. In addition, there was no significant main effect or interactive effect of effort on GHQ scores.

6.6.3 Summary of wave 2 questionnaire analysis

The results of the regression analysis of the questionnaire data on wave 2 indicate, as in wave 1, lack of interactive effects of demands and resources. Main effects of resources were found again for the same three outcome variables as in wave 1 and in a direction consistent with theoretical expectations. Although in wave 1 main effects of effort were observed for all outcome variables, in wave 2 main effects were found only for the strain outcome variable, suggesting that effort reduces strain. Consistent with the results of the second regression analysis of the questionnaire data of wave 1, statistically significant interactive effects of effort with resources on strain were found, demonstrating that high resources reduce the effects of effort on strain.

6.7 Overview of the findings of the questionnaire analysis

Overall, the analysis of the questionnaire data failed to demonstrate any support for the interactive hypothesis of the demand – control. The results indicated main effects of resources on the outcome variables, in the hypothesized theoretical direction. Additionally, main effects of effort were observed, which suggested a beneficial effect of effort. Moreover, the findings of a buffering effect of resources on effort and a buffering effect of effort and resources on demands are worth noting. Finally, looking at the controlled variable of marital status, it was indicated that it is associated with a reduction in GHQ scores and an increase in job satisfaction, thus justifying its inclusion as control factor in the analysis.

6.8 (a) Diaries – Aggregated analysis – Wave 1

The means across the 24 diary completion days were calculated for each individual. A summary of these mean variables for each individual can be found in the appendix. The analyses were carried out on 226 individuals that completed the diaries in the first wave.

6.8.1 (a) Correlation analysis

Table 6.16: Descriptive statistics and correlation matrix of the variables – ***Aggregated data*** – (n = 226)

Variables	*Mean*	*SD*	*DEM*	*RES*	*EFRT*	*STR*	*HC*
Age	34.5	6.91					
Married	64						
Single	31						
Divorced	1.4						
Demands (DEM)	4.68	1.06					
Resources (RES)	6.24	1.09	.00				
Effort (EFRT)	2.68	.28	-.04	.12			
Strain (STR)	3.97	.96	.26**	-.56**	-.11		
Health Complaints (HM)	.36	.25	.24**	-.32**	-.09	.59**	
Effectiveness	7.01	.99	-.01	.56**	.19**	-.50**	-.36**

Note 1: For dichotomous variables the percentages are given and for numerical variables the means, SD and product moment correlation coefficients are given.
** $p < .01$

Looking at the correlation matrix above, the demands variable showed moderate positive correlations with strain ($r = .26, p < .01$) and health complaints ($r = .24, p < .01$), indicating detrimental effects of job demands, as expected. Strong negative correlations of resources with strain ($r = -.56, p < .01$) and health complaints ($r = -.32, p < .01$) were observed. In addition, a strong positive correlation of resources with effectiveness was also found ($r = .56, p < .01$). Finally, effort showed a small positive correlation with effectiveness ($r = .19, p < .01$) but not with any other variable. Looking briefly at the

dependent variables, they showed moderate to strong intercorrelations in the expected theoretical direction.

6.8.2 (a) Regression analysis

Table 6.17: Summary of the moderated regression analysis – Aggregated data (a) – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.027	.027	-.164*	< .05
2.	**Married**	.029	.002	.093	ns
	Single			.044	ns
	Divorced			.006	ns
3.	**Demands**	.081	.051	.232**	< .01
4.	**Resources**	.331	.250	-.509***	< .001
5.	**Demands x Resources**	.338	.008	-.091	ns
6.	**Effort**	.339	.000	.009	ns
7.	**Demands x Effort**	.360	.021	-.119	ns
	Effort x Resources			.058	ns
	Demands x Resources x Effort			.155*	< .05

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

In the examination of the strain variable, age was found to have a significant effect on strain ($\beta = -.164$, $F = 20.126$, $p < .05$). However, as previously noted, the effects of this variable have already been controlled for.

Demands, on the other hand, accounted for a significant 5.1 % of the variance in strain ($\beta = .232$, $F = 11.979$, $p < .01$), indicating, not surprisingly, a detrimental effect of job demands on well-being. Furthermore, resources accounted for a significant 25 % of the variance in strain ($\beta = -.509$, $F = 79.716$, $p < .001$). Again this finding is expected, as it suggests that the resources available to the individual enable him to experience less strain.

More importantly, a significant interactive effect of demands, resources and effort on strain was observed ($\beta = .155, p < .05$). According to this result, high resources and effort enhance the effects of demands on strain and this will be considered later on.

Table 6.18: Summary of the moderated regression analysis – Aggregated data (a) – ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.001	.001	.034	ns
2.	**Married**	.015	.014	-.245	ns
	Single			-.165	ns
	Divorced			-.102	ns
3.	**Demands**	.063	.048	.224**	< .01
4.	**Resources**	.169	.105	-.330***	< .001
5.	**Demands x Resources**	.179	.010	-.107	ns
6.	**Effort**	.181	.002	-.046	ns
7.	**Demands x Effort**	.191	.010	.029	ns
	Effort x Resources			-.009	ns
	Demands x Resources x Effort			.088	ns

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

Examining the health complaints variable, the background variables of age and marital status did not have any significant effect on health complaints. Demands, on the other hand, accounted for a significant 4.8 % of the variance in health complaints ($\beta = .224$, $F = 10.995, p < .01$). This finding is congruent with research that has found detrimental effects of demands. Furthermore, resources accounted for a significant 10.5 % of the variance in health complaints ($\beta = -.330$, $F = 26.991, p < .001$), indicating that resources are a major predictor of effectiveness. Overall, the two independent variables (demands, resources) accounted for 17 % of the variance in health complaints ($R^2 = .169$, $F = 7.200$, $p < .001$).

Unexpectedly, no significant interactive effects of demands with resources the on health complaints were found. Finally, no main or interactive effects of effort on health complaints were found.

Table 6.19: Summary of the moderated regression analysis – Aggregated data (a) – ***Effectiveness***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.007	.007	.081	ns
2.	**Married**	.025	.018	-.422	ns
	Single			-.449*	< .05
	Divorced			-.066	ns
3.	**Demands**	.026	.001	.030	ns
4.	**Resources**	.259	.234	.491***	< .001
5.	**Demands x Resources**	.261	.002	.048	ns
6.	**Effort**	.263	.002	.045	ns
7.	**Demands x Effort**	.326	.062	.142*	< .05
	Effort x Resources			-.122	ns
	Demands x Resources x Effort			-.308**	< .01

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

Figure 6.2: Effectiveness as a function of joint effects of demands and effort (Wave 1)

Examining the effectiveness variable, the background variables of age and marital status did not have any significant effect on effectiveness. Similarly, demands did not have any significant effect on effectiveness. Resources, on the other hand, accounted for a significant 23 % of the variance in effectiveness ($\beta = .491$, $F = 67.154$, $p < .001$), as was expected from theory.

Surprisingly, the interaction of demands with resources did not have any significant effect on effectiveness. Similarly, effort did not have any effect on effectiveness. On the other hand, and the interactions of effort with demands, effort with resources and the 3-way interaction of demands, resources and effort accounted for a significant increase in the variance in effectiveness ($\Delta R^2 = .062$, $F = 6.416$, $p < .001$) suggesting that the above interactions are major predictors of effectiveness.

An interesting finding is the significant interactive effect of demands and effort on effectiveness ($\beta = .142$, $p < .05$). According to this finding, high effort enhances the effects of demands on effectiveness and this will be considered later on. Moreover, a significant interactive effect of demands, resources and effort on effectiveness was observed ($\beta = -.308$, $p < .01$). This is an important finding as it implies that high resources and high effort reduce the effects of demands on effectiveness, thus demonstrating a suppressing effect of resources and effort.

Figure 6.2 illustrates that the form of the interaction is consistent with the results. The Figure illustrates an increase in the demand – effectiveness slope, as effort increases from low to high.

6.8.3 (a) Summary of wave 1 diary aggregated analysis

The results of the aggregated analysis of the diary data of wave 1 did not demonstrate any support for the hypothesised interaction of the demand – control model. Only main effects of the independent variables were observed. In particular, main effects of demands were found for the two out of the three outcome variables. The sign of the regression coefficients indicated detrimental effects of job demands, a finding that is well-documented in the existing literature. Statistically significant main effects of resources on all the outcome variables were demonstrated, in the hypothesised theoretical direction.

A further noteworthy finding is the interactive effect of demands and effort on effectiveness, indicating negative effects of effort. Additionally, statistically significant interactive effects of demands, resources and effort on two outcome variables were observed. The direction of the above interactions, however, differed for each of the outcome variables. Rather unexpectedly, for the strain outcome variable, enhancing effects of resources and effort were found. On the other hand, for the effectiveness outcome variable, suppressing effects of resources and effort were observed.

6.8 (b) Diaries – Aggregated analysis - Wave 1

In order to check the stability of the results of the diary means, the same regression analysis were conducted on the individuals that completed the diary on the first wave, after removing the individuals that did not complete the diary on the second wave. Therefore, 141 individuals were included in this analysis.

6.8.1 (b) Correlation analysis

Table 6.20 Descriptive statistics and correlation matrix of the variables – ***Aggregated data*** – (n = 141)

Variables	*Mean*	*SD*	*DEM*	*RES*	*EFRT*	*STR*	*HC*
Age	33.4	7.22					
Married	54.6						
Single	41.8						
Demands (DEM)	4.59	1.03					
Resources (RES)	6.31	1.06	.07				
Effort (EFRT)	2.67	.22	.01	.01			
Strain (STR)	4.00	.86	.29**	-.42**	.01		
Health complaints (HC)	.37	.24	.28**	-.26**	-.06	.54**	
Effectiveness	7.08	.89	.05	.48**	.21*	-.37**	-.27**

Note: For dichotomous variables the percentages are given and for numerical variables the means, SD and product moment correlation coefficients are given.
* $p < .05$ ** $p < .01$

Looking at the table above, demands correlated moderately with two of the outcome variables, strain ($r = .29, p < .01$) and health complaints ($r = .28, p < .01$). This finding was expected as it suggests detrimental effects of job demands. Furthermore, resources showed strong negative correlations with strain ($r = -.42, p < .01$) and health complaints ($r = -.26, p < .01$). In addition, a strong positive correlation between resources and effectiveness ($r = .48, p < .01$) was found. Finally, effort correlated moderately with effectiveness ($r = .21, p < .05$), indicating that effort is linked with an increase in effectiveness, a finding that will be considered later.

6.8.2 (b) Regression analysis

Table 6.21: Summary of the moderated regression analysis – Aggregated data (b) – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.069	.069	-.263**	< .01
2.	**Married**	.077	.008	.151	ns
	Single			.054	ns
3.	**Demands**	.163	.086	.302***	< .001
4.	**Resources**	.319	.157	-.403***	< .001
5.	**Demands x Resources**	.325	.006	-.084	ns
6.	**Effort**	.326	.001	-.024	ns
7.	**Demands x Effort**	.339	.013	-.120	ns
	Effort x Resources			-.026	ns
	Demands x Resources x Effort			.128	ns

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

As can be seen from the table, age accounted for a significant 6.9 % of the variance in strain ($\beta = -.263$, $F = 10.358$, $p < .01$). The effects of this background variable, however, have been controlled for. In addition, demands accounted for a significant 8.6 % of the variance in strain ($\beta = .302$, $F = 13.920$, $p < .001$), suggesting that job demands are a major predictor of strain. Similarly, resources accounted for a significant 15.7 % of the variance in strain ($\beta = -.403$, $F = 31.062$, $p < .001$). This result is consistent with evidence that indicates beneficial effects of resources.

Rather unexpectedly, no significant interactive effects of demands and resources on strain were found. Finally, effort, the interactions of effort with demands, effort with resources and the three-way interaction of demands, resources and effort did not have any statistically significant effect on strain.

Table 6.22: Summary of the moderated regression analysis – Aggregated data (b) – ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.002	.002	.043	ns
2.	**Married**	.018	.016	-.251	ns
	Single			-.124	ns
3.	**Demands**	.095	.078	.287**	< .01
4.	**Resources**	.185	.089	-.304***	< .001
5.	**Demands x Resources**	.215	.030	-.189*	< .05
6.	**Effort**	.217	.003	-.053	ns
7.	**Demands x Effort**	.245	.028	-.137	ns
	Effort x Resources			-.005	ns
	Demands x Resources x Effort			.216	ns

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

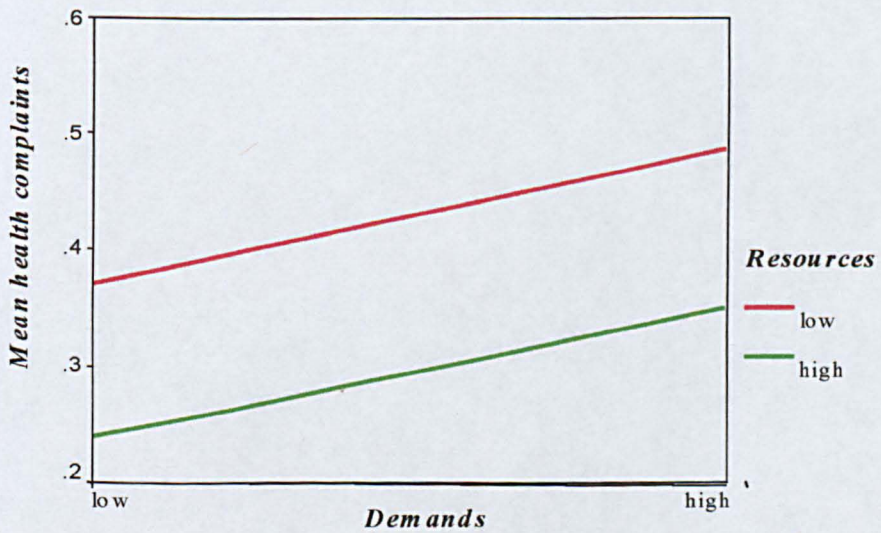

Figure 6.3: Health complaints as a function of joint effects of demands and resources

In the examination of the health complaints variable, the background variables of age and marital status did not have any significant effect on health complaints. Demands, on the other hand, accounted for a significant 7.8 % of the variance in health complaints (β = .287, F = 11.655, $p < .01$), demonstrating that job demands increase health complaints, a

result that is congruent with theoretical expectations. Similarly, resources accounted for a significant 8.9 % of the variance in health complaints (β = -.304, F = 14.800, $p < .001$). The result is in agreement with evidence that indicates positive effects of both job control and social support. Overall, the two main effects account for a significant 18 % of the variance in health complaints (R^2 = .185, F = 6.109, $p < .001$), indicating that demands and resources are major predictors of health complaints.

Of importance to the test of the demand – control model, the interaction of demands and resources accounted for a significant 3 % of the variance in health complaints (β = -.189, F = 5.119, $p < .05$). This finding is congruent with theory as it suggests that high resources reduce the effects of demands on health complaints, thus demonstrating a buffering effect of resources.

Figure 6.3 illustrates the joint effects of demands and resources in health complaints. However, although the results indicate a significant interaction effect, the graph indicates only main effects. This may be due to possible nonlinearity.

Table 6.23: Summary of the moderated regression analysis – Aggregated data (b) – ***Effectiveness***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.031	.031	.177*	< .05
2.	**Married**	.067	.035	-.399	ns
	Single			-.506*	< .05
3.	**Demands**	.067	.000	.011	ns
4.	**Resources**	.271	.204	.460***	< .001
5.	**Demands x Resources**	.292	.021	.159*	< .05
6.	**Effort**	.340	.048	.223**	< .01
7.	**Demands x Effort**	.353	.013	-.061	ns
	Effort x Resources			-.103	ns
	Demands x Resources x Effort			.061	ns

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

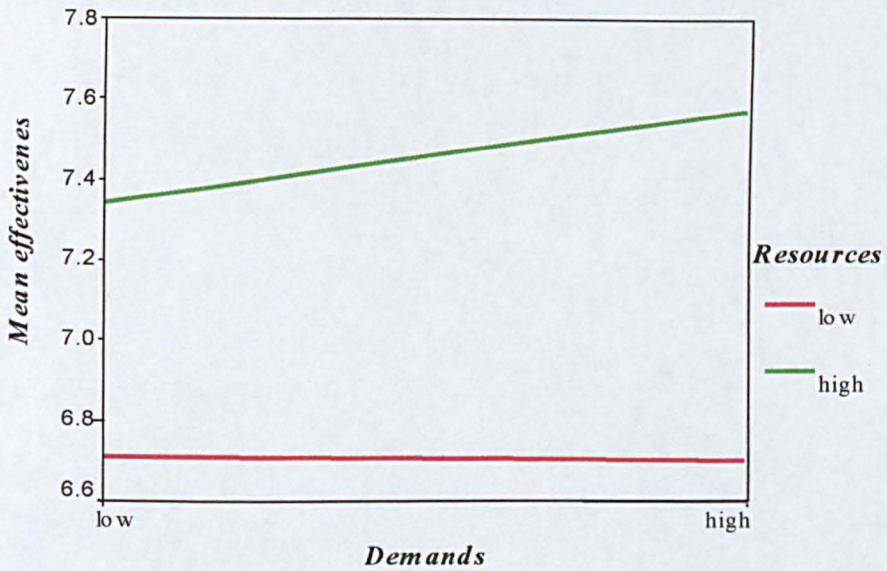

Figure 6.4: Effectiveness as a function of joint effects of demands and resources

Finally, examining the effectiveness variable, age accounted for a significant 3 % of the variance in effectiveness ($\beta = .177$, $F = 4.470$, $p < .05$). The effects of this variable, however, have already been controlled for.

Looking at the main effects, no significant main effect of demands on effectiveness was found. Resources, on the other hand, accounted for a significant 20.4 % of the variance in effectiveness ($\beta = .460$, $F = 37.730$, $p < .001$), indicating that resources are a major predictor of effectiveness, as is often reported in the literature.

Most interestingly, the interaction of demands with resources accounted for a significant 2 % of the variance in effectiveness ($\beta = .159$, $F = 3.988$, $p < .05$). However, quite surprisingly, according to the above finding, high resources enhance the effects of demands on effectiveness. This suggested an enhancing rather than a buffering effect of resources. This result will be considered later on.

Moreover, effort accounted for a significant 4.8 % of the variance in effectiveness ($\beta = .223$, $F = 9.685$, $p < .01$), indicating that effort increases effectiveness. This is an important finding and its implications will be discussed in detail.

As can be seen in Figure 6.4, there is an increase on the demands – effectiveness slope as resources increase from low to high, thus demonstrating a positive interaction.

6.8.3 (b) Summary of wave 1 diary aggregated analysis

The second regression analysis that was carried out on the aggregated diary data of wave 1, only for the individuals that completed the diaries on both waves, demonstrated several additional findings. Further to the main effects of demands and resources on the same outcome variables as before, statistically significant interactive effects of demands and resources were observed on two of the outcome variables. In particular, for the outcome variable of health complaints, a suppressing effect of resources was found, a result that is consistent with the demand – control hypothesis. On the other hand, however, an enhancing effect of resources was found for the effectiveness outcome variable. Another finding that was not demonstrated in the first regression analysis was a statistically significant main effect of effort on effectiveness, indicating that effort increases effectiveness.

6.9 Diaries – Aggregated analysis - Wave 2

The same regression analysis was carried out on the aggregated diary data from wave 2. The analysis was therefore carried out on the 141 individuals that completed the diaries on wave 2.

6.9.1 Correlation analysis

Table 6.24: Descriptive statistics and correlation matrix of the variables – ***Aggregated data*** – (n = 141)

Variables	*Mean*	*SD*	*DEM*	*RES*	*EFRT*	*STR*	*HC*
Age	34.3	7.26					
Married	53.9						
Single	39.7						
Demands (DEM)	4.70	1.05					
Resources (RES)	6.30	.94	.08				
Effort (EFRT)	2.65	.24	.09	-.14			
Strain (STR)	3.77	.83	.24**	-.36**	.11		
Health complaints (HC)	.31	.21	.09	-.31**	.09	.40**	
Effectiveness	7.02	.76	-.01	.33**	.11	-.24**	-.32**

Note: For dichotomous variables the percentages are given and for numerical variables the means, SD and product moment correlation coefficients are given.
** $p < .01$

Looking at the correlation matrix, demands correlated with only one of the outcome variables. Specifically, a moderate correlation between demands and strain ($r = .24, p < .01$) was found. This result is expected, as job demands are usually associated with an increase in strain. Resources also showed moderate negative correlations with strain ($r = -.36, p < .01$) and health complaints ($r = -.31, p < .01$), as was expected. In addition, there was a moderate correlation between resources and effectiveness ($r = .33, p < .01$), in the expected theoretical direction. The important implications of this result will be considered in detail. Finally, effort did not show any significant correlations with any of the outcome variables. The dependent variables showed moderate to strong intercorrelations, all of which were in the expected theoretical direction.

6.9.2 Regression analysis

Table 6.25: Summary of the moderated regression analysis – Aggregated data – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.051	.051	-.227	ns
2.	**Married**	.063	0.11	-.222	ns
	Single			-.190	ns
3.	**Demands**	.118	.055	.241**	< .01
4.	**Resources**	.289	.171	-.417***	< .001
5.	**Demands x Resources**	.309	.020	-.152	ns
6.	**Effort**	.312	.003	.058	ns
7.	**Demands x Effort**	.317	.006	.066	ns
	Effort x Resources			-.016	ns
	Demands x Resources x Effort			-.017	ns

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

In the examination of the strain outcome variable, the background variables of age and marital status accounted for a significant 6.3 % of the variance in strain ($R^2 = .063$, F = 3.032, $p < .05$). However, the effects of these variables have already been controlled for. Similarly, demands accounted for a significant 5.5 % of the variance in strain (β = .241, F = 8.480, $p < .01$), indicating, as expected, detrimental effects of demands. Furthermore, resources accounted for a significant 17 % of the variance in strain (β = -.417, F = 32.176, $p < .001$), suggesting that resources are a significant predictor of strain. The sign of the regression coefficient suggests beneficial effects of resources on strain, a finding that is well documented in the literature.

Table 6.26: Summary of the moderated regression analysis – Aggregated data – ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.000	.000	.001	ns
2.	**Married**	.011	.011	.211	ns
	Single			.204	ns
3.	**Demands**	.022	.011	.109	ns
4.	**Resources**	.124	.102	-.322***	< .001
5.	**Demands x Resources**	.174	.050	-.242**	< .01
6.	**Effort**	.175	.000	.014	ns
7.	**Demands x Effort**	.188	.014	-.002	ns
	Effort x Resources			-.031	ns
	Demands x Resources x Effort			.122	ns

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

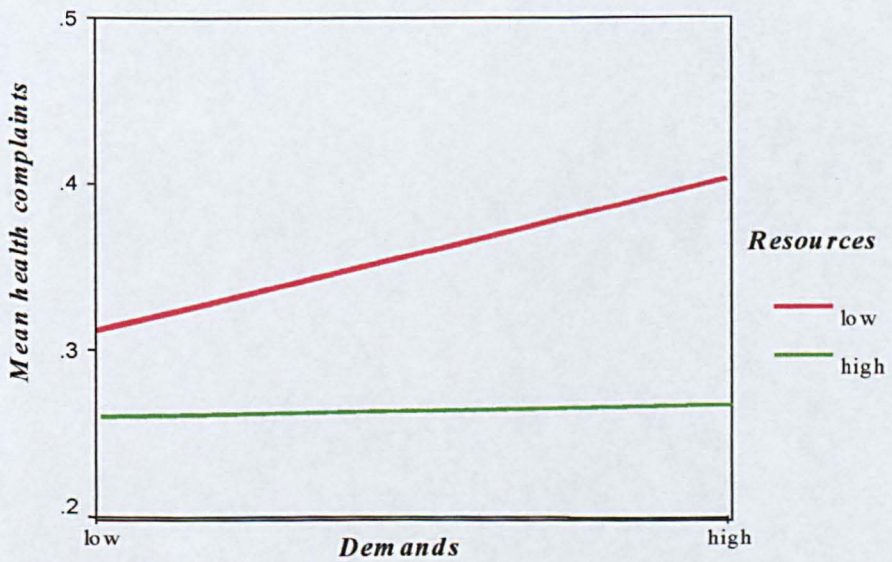

Figure 6.5: Health complaints as a function of joint effects of demands and resources – Wave 2

Examining the health complaints variable, the background variables of age and marital status did not have any effect on health complaints. Similarly, job demands did not

have any significant effect on health complaints. Resources, however, accounted for a significant 10.2 % of the variance in health complaints ($\beta = -.322$, $F = 15.634$, $p < .001$), indicating that resources are a major predictor of health complaints and suggesting positive effects of resources, as was expected from theory.

More interesting to the test of the demand-control model, the interaction of demands with resources accounted for a significant 5 % of the variance in health complaints ($\beta = -.242$, $F = 8.091$, $p < .01$). This result is congruent with theory as it suggests that high resources reduce the effects of demands on health complaints, thus demonstrating a buffering effect of resources. The implications of this important finding will be discussed later on.

Figure 6.5 illustrates that the form of the interaction is in the predicted theoretical direction indicating that under conditions of high resources the effects of demands on health complaints are reduced.

Table 6.27: Summary of the moderated regression analysis – Aggregated data – ***Effectiveness***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.006	.006	-.070	ns
2.	**Married**			.004	ns
	Single			.012	ns
3.	**Demands**	.006	.000	-.011	ns
4.	**Resources**	.106	.101	.320***	< .001
5.	**Demands x Resources**	.113	.007	.088	ns
6.	**Effort**	.142	.029	.175*	< .05
7.	**Demands x Effort**	.193	.051	-.053	ns
	Effort x Resources			.204*	< .05
	Demands x Resources x Effort			-.054	ns

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

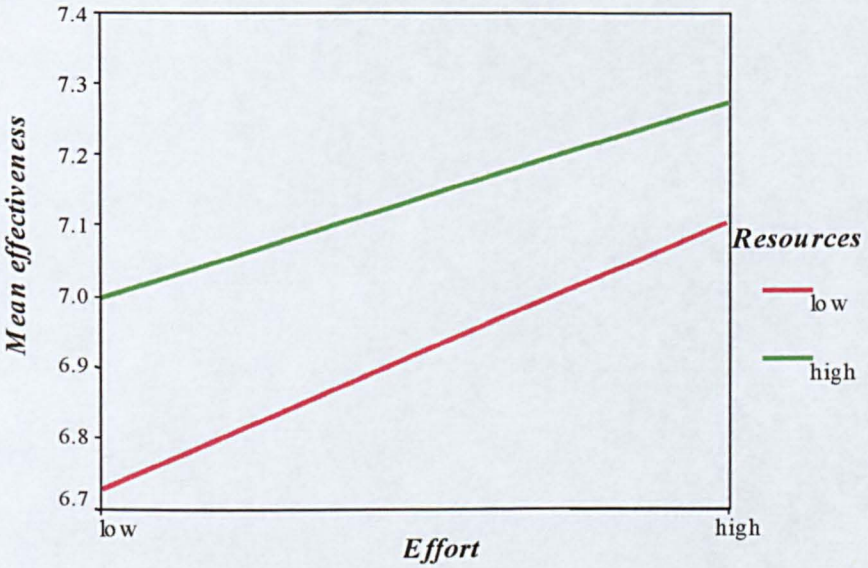

Figure 6.6: Interactive effects of effort and resources on effectiveness – Wave 2

Finally, in the examination of effectiveness, the background variables of age and marital status did not have any significant effect on effectiveness. Similarly, demands were not found to have any significant effect on effectiveness. Resources, on the other hand, accounted for a significant 10 % of the variance in effectiveness ($\beta = .320$, $F = 15.070$, $p < .001$), thus coinciding with the theory. Rather unexpectedly, the interaction of demands with resources did not have any significant effect on effectiveness.

Effort, on the other hand, accounted for a significant 2.9 % of the variance in effectiveness ($\beta = .175$, $F = 4.418$, $p < .05$), implying that effort increases effectiveness. This finding will be discussed further later.

In addition, the interaction of effort with demands, effort with resources and the three-way interaction of demands, resources and effort accounted for a significant increase in the variance in effectiveness ($\Delta R^2 = .051$, $F = 2.719$, $p < .05$). Interestingly, a significant

interactive effect of effort and resources on effectiveness was observed ($\beta = .204$, $p < .05$). However, the direction of the interaction indicated, rather unexpectedly, that high resources enhance the effects of effort on effectiveness.

Figure 6.6 illustrates the form of the interaction, as was indicated in the results. Specifically, an increase in the effectiveness – effort slope is observed, as resources increase from low to high.

6.9.3 Summary of wave 2 diary aggregated analysis

The results of the aggregated analysis indicated a statistically significant interactive effect of demands and resources on the outcome variable of health complaints. The direction of the interaction was in the theoretically hypothesised direction, demonstrating a buffering effect of resources. Additionally, a main effect of demands was found only for the strain outcome variable. Resources demonstrated statistically significant main effects on all the outcome variables and the sign of the regression coefficient suggested beneficial effects of resources. Moreover, a beneficial effect of effort on effectiveness is worth noting. On the other hand, for the outcome variable of effectiveness, an enhancing effect of resources on effort was demonstrated.

6.10 Overview of the findings of the diary aggregated analysis

Overall, the aggregated analysis of the diary data failed to demonstrate significant support for the interactive hypothesis of the demand – control model. The results indicated predominantly main effect, in the expected theoretical direction. In the analysis of the second wave of data, the results indicated one statistically significant interactive effect of demands and resources on the outcome variable of health complaints. This coincided with

the results of the second analysis of the data of the first wave. This second analysis additionally demonstrated a counterintuitive enhancing effect of resources for the outcome variable of effectiveness.

6.11 Discussion

6.11.1 Overview

The present study assessed the demand – control model within a diary-based framework, thus attempting to capture the dynamic relationships between the variables under consideration. Effort has been examined as the main regulatory process in the active management of job demands and therefore its inclusion in the present study was considered essential. As previously noted, the study was conducted at different levels of analysis and therefore provides a more rigorous examination of the model. With the use of two different analytic approaches for the diary data and a conventional analysis for the questionnaire data, the results can be compared and the differential results in terms of the demand – control model are discussed. The present chapter dealt with the cross-sectional between-individuals analysis of the questionnaire and the diary data. As mentioned earlier, the second analytic procedure that was conducted on the diary data will be presented in chapter 7.

The demand – control model was initially tested using the conventional questionnaire method. The majority of studies that examine the model use questionnaires and a cross-sectional framework. Problems associated with cross-sectional studies, which are based on differences between people at a certain time, have been previously considered. These include difficulties in establishing causality between the variables and interference

of unmeasured third variables that may create spurious relationships between the study variables. Since questionnaires assess variables at a single point in time, they do not capture the dynamics of the various variables and the way they unfold in time. Moreover, as they are based on retrospective recall, they suffer from recall biases such as faulty memory. In conclusion, analysis using the questionnaire data is the crudest method of analysis. The main advantage, however, of the questionnaire used in the present study is its reliability as it consists of a battery of well-validated and reliable scales.

Two different analytical procedures were conducted on the data obtained from the diaries in order to examine the demand – control model more thoroughly. The second procedure will be presented and discussed in chapter 7. First, the diary data were aggregated to the individual level. Consequently, the means across the 24 diary completion days were calculated for each individual and separate analyses were conducted using the above diary means. As previously discussed, aggregation is a powerful procedure that yields highly reliable results as it reduces error of measurement, that is, transient factors unrelated to the personality of the individuals (Epstein, 1980). Error of measurement could be due to spurious sources of correlation and to individuals' extreme answers and cannot be dissociated from demonstrations of stability since high error of measurement reduces the possibility of demonstrating stability (Epstein, 1986). In summary, aggregation is a more sophisticated procedure that improves the reliability of results and offers the possibility of making replicable generalisations of the findings.

The findings of the analysis of the questionnaire data and of the cross-sectional analysis of the diary data will be discussed below separately.

6.11.2 Findings of the questionnaire analysis

The results of the conventional analysis with the questionnaire data indicated no support for the interactive hypothesis of the demand – control model. Largely main effects of resources and effort were found. Jaccard, Turrisi & Wan (1990) point out that main effects usually are a meaningful piece of information. We will therefore consider these findings below. Job control was associated with reduced strain, health complaints and GHQ scores. This coincides with meta-analyses that have shown strong and consistent relationships between perceived control over specific work aspects and outcomes, such as job satisfaction and well-being (Spector, 1986). Additionally, it is consistent with previous research which indicates that control of job requirements influences various aspects of a worker's health, health-related behaviour and other dimensions of well-being (Aronsson, 1989; Fisher, 1985; Karasek & Thoerell, 1990; Landsbergis *et al.*, 1992; Spector, 1986; Vahtera, Pentti & Uutela, 1996). Control as an intervention strategy has been shown to reduce emotional stress (Jackson, 1983; Wall & Clegg, 1981) and to reduce anxiety and somatic complaints (Frese, 1987). The above findings therefore support the notion that enhancing control beliefs through strategies such as participation in decision making (Jackson, 1983), autonomous work groups (Wall & Clegg, 1981), work schedule autonomy (Pierce & Newstrom, 1983), or employee involvement in systems decision making (Frese, 1987), may help in the long run to reduce strain and health complaints and increase job satisfaction (Teuchmann, Totterdell & Parker, 1999).

Moreover, the results indicated that job control was associated with an increase in job satisfaction. This finding is consistent with previous findings regarding perceived job control and job satisfaction among nurses (Fox *et al.*, 1993; Hurrell & McLaney, 1989; Munro, Rodwell & Harding, 1998).

A final point regarding job control and job satisfaction deserves some comment. Karasek (1979) noted that job control is usually related to the organisation's structure. Therefore, nursing in a team-oriented organisational structure offers greater opportunities for participation, higher levels of job demands and greater job control than traditional hierarchical nursing structures (Bussing, 1988). Bussing demonstrated that job satisfaction in nursing is determined both from the level of control which is established by the organisation and the extent to which nurses can maximise this control (Munro, Rodwell & Harding, 1998) and this should be taken into consideration in future intervention studies.

Main effects of support on the outcome variables were also observed. There is ample evidence for the importance of social support in directly affecting health variables, including mortality and cardiovascular and immune functioning (Uchino, Cacioppo & Kiecolt-Glaser, 1996). Cross-sectional studies have consistently demonstrated significant relationships between social support and job satisfaction (Boumans & Landeweerd, 1992; Moyle, 1998; Parkes *et al.*, 1994), physical and mental health (Digman & West, 1988; Loscocco & Spitze, 1990).

Although the evidence for the main effects of social support on outcomes at work has been fairly consistent, indicating beneficial effects on work and health outcomes, causality in these relationships is unclear (Fisher, 1985). One view is that having supportive relationships with others at work creates a more pleasant and rewarding work environment, therefore resulting in higher satisfaction and lower turnover. Alternatively, social support must be earned by displaying appropriate role behaviour and attitudes. If employees are to receive support from co-workers and superiors, they must show signs of commitment, satisfaction and performance potential. The above explanations suggest a positive relationship between support and favourable outcomes. A different view that predicts a

negative relationship is that only when the individual shows signs of being dissatisfied or preparing to quit, thus indicating the need for support, social support is mobilised and provided. It seems obvious that although main effects of social support on outcomes are usually found, it is difficult to provide a clear explanation for them (Fisher, 1985).

In summary, the main effects of resources found in the present analysis are consistent with other studies involving nursing populations that found an association between psychological disorders and job control (Parkes, 1982; Patterson, Arnetz & Arnetz, 1995) and social support (Bourbonnais *et al.*, 1999; Browner, 1987; Fong, 1993; Oehler *et al.*, 1991).

6.11.3 Findings of the aggregated diary analysis

Looking at the results of the aggregated analyses, they failed to provide support for the interactive hypothesis of the demand – control model. Mostly statistically significant main effects of demands and resources were observed. Only one interactive effect of demands and resources on health complaints was found out of the six that were tested, so it should be attributed to chance.

In order to check the stability of the results, the same regression analysis was repeated for the participants that completed the diary on both waves, after removing the participants that did not complete the diary in the second wave. The second analysis with this particular sample revealed 2 interactive effects out of the three that were tested. Specifically, a buffering effect of resources on health complaints was found and this finding was consistent with the finding from wave 2. In addition, an interactive effect of demands and resources on effectiveness was found, but the direction of the effect was

opposite from the one predicted. In particular, an enhancing effect of resources was indicated. All the above will be discussed further.

The finding that job demands increase strain and health complaints and reduce effectiveness was consistent with expectations. A large body of research suggests that prolonged exposure to high job demands may have a variety of work- and health-related outcomes, including mental and physical disorders, cardiovascular complaints, absenteeism and decreased productivity (Fox *et al.*, 1993; Theorell & Karasek, 1990) and this highlights the importance of research addressing the factors that could mitigate the negative effects of high job demands.

The finding of main effects of resources on the outcome variables will not be considered further, as it has been already discussed. The results of the aggregated analysis additionally indicated enhancing effects of control and support. This will be considered below.

A possible explanation for the enhancing effects of job control that were found has been provided by de Jonge *et al.*, (2000). They assert that in the case of emotional demands, there is a potential negative side of possessing high job control. Many workers in the health care sector feel some ambivalence in curing and caring for intensely suffering patients or clients. Employees that report having low control have the opportunity of avoiding the internal attributions of failure that might be associated with the feeling that they could not prevent the suffering or dying of a very ill patient. The above has been documented by a number of researchers (Fox, Dwyer & Ganster, 1993; de Jonge *et al.*, 1999).

Moreover, Averill's (1973) classic review of human and animal studies of control and stress indicated a sizable minority of subjects find that control is stress inducing rather than stress reducing. According to Averill (1973: 293) "poor (or inefficient) use of control"

leading to negative self-efficacy appraisals, "might increase the stressfulness of a situation by providing negative feedback to the subject". Poor utilisation of control makes a stressful situation worse because it sends negative feedback to the individual (Schaubroeck, Jones & Xie, 2001). It has been suggested that persons with low efficacy disregard their perceived level of control because they judge the relevant coping response as lacking from their individual repertoire. Fisher (1985), after reviewing the evidence from a range of stress studies, suggested that lower control in difficult situations may reduce the stressfulness experienced by low efficacy persons because it enables them to make situational attributions for difficulties and failure, thereby protecting their self-esteem.

An additional explanation for the enhancing effects of control is provided by Bazerman, 1982, cf. Schaubroeck & Fink, 1998): "too much control, relative to abilities, promotes threatening feelings of personal incompetence" and therefore would be associated with negative, rather than positive outcomes.

Enhancer effects of social support, in which support appears to exacerbate the effects of stressful conditions on health, have been reported by others as well (Ganster *et al.*, 1986; Winnubst *et al.*, 1982). Consequently, it would be useful to speculate about processes that could produce enhancer effects. It has been argued that the emotional support component of social support does not change the objective stress situation, particularly in the presence of physical stressors (Frese, 1999). It has also been suggested that high levels of social support may have negative consequences in mental health settings (Sandler & Barrera, 1984). Possibly social support increases strain given certain stress situations. Support might even accentuate the stressor situation without being able to help deal with it. The enhancer effects of social support merit close attention in future studies. These conflicting findings stem in part from a lack of consensus over the definition of social

support, which is often referred to as a unitary construct when in fact it appears to be multidimensional, broad in scope and highly heterogeneous. More precise definitions of social support based on functional categories such as emotional support, information support and instrumental support have been proposed (House & Kahn, 1985; Turner, 1981), but the different functions have been found to be highly correlated (Forbes & Roger, 1999).

The results of the aggregated analysis possibly support the notion of "differential associations" (Warr, 1990), which asserts that different kinds of job demands are, in combination with job control, differentially associated with various outcome variables. Warr argues that particular job characteristics may be more or less significant in relation to different aspects of employee health and that may account for the dissimilar findings in different outcome variables. In line with the above, De Lange, Taris, Kompier, Houtman & Bongers (2002) asserted that different outcome variables may be linked to different degrees to the job characteristics included in a study. Not all of them can be considered to represent the Karasek's strain concept equally well. According to Karasek (1979) strain refers to a chronic affective response to a stressful environment. Consequently, depression, anxiety, anger can be considered to be the best representatives of strain whereas job satisfaction includes motivational aspects as well and cannot be considered a strain indicator. In agreement with these reservations, it would seem important that future research explore more and more varied outcomes in relation to the demand – control model and include objective outcomes as well. These issues will be developed further later.

6.11.4 Considerations on the lack of interactive effects

Both the questionnaire analysis and the aggregated analysis of the diary data did not provide any substantial support for the interactive hypothesis of the demand – control

model. The lack of convincing evidence for the interactive effect of job demands and job control in the present study is consistent with previous findings in nursing populations (de Jonge *et al.*, 1996; de Rijk *et al.*, 1998; Landsbergis, 1988) and other populations as well (Fox *et al.*, 1993; Hurrell & McLaney, 1989; Munro, Rodwell & Harding, 1998). Possible reasons to account for the failure to detect interactive effects will be discussed next.

Finney *et al.* (1984) postulated that the lack of interactive effects may be due to lack of statistical power and recommended the use of larger samples as a way to increase powerfulness. Moreover, our construct of demands incorporated both emotional and physical demands and significant interactions between physical or emotional demands and job control have not often been reported in the literature (Andries, Kompier & Smulders, 1996; de Jonge *et al.*, 1999, 2000; Söderfeldt *et al.*, 1996).

A further potential explanation for the lack of interactive effects has to do with the role of individual difference variables. Ganster, Fox & Dwyer (2001) asserted that the demand – control model should be extended to include individual differences that might determine the buffering effect of job control. They asserted that higher order interactions operate that may account for the failure to demonstrate the two-way interaction that is usually hypothesized. This view has been echoed by several researchers (Karasek, 1979; Parkes, 1990, 1994; Siegrist *et al.*, 1990; Xie, 1996). More specifically, Parker & Sprigg (1999) hypothesised that the demand – control model interaction would apply primarily to proactive employees. This suggestion is especially relevant when the mechanism by which job control is suggested to have its stress-reducing effects is considered. The assumption underlying the proposed interaction between job demands and job control is that incumbents in active jobs will act proactively when they have the autonomy to do so, thereby channelling their energy in a constructive way and thus reducing strain. However, not all

employees approach their environment in a proactive manner. Similarly, Schaubroeck & Merritt (1997) found that self-efficacy moderated the demands – control relationship. They found that for people high in self-efficacy, high control combined with high job demands was associated with positive health outcomes, while for people low in self-efficacy, high job control in combination with high job demands was associated with negative health outcomes. Moreover, in a study of nurses, de Rijk *et al.*, (1999) found support for the interaction effect only for those individuals high in active coping.

Another view that may account for the failure to detect the hypothesised interaction of demands and control is that demands should match the control construct (Frese, 1989, 1999; Wall *et al.*, 1996). At best, job control should be measured specifically because different aspects of control may interact with different types of demands. On the one hand, different facets of job control, such as choice of methods (plans), scheduling (timeframe) and criteria (goals) of work can be distinguished (Breaugh, 1985; Frese, 1989). This suggests that only particular interactions may be found. For example, choosing working methods that fit one's abilities may help when physical demands are high and changing qualitative or quantitative criteria may help depending on the amount of time pressure. On the other hand, new concepts of job control may be required if particular demands such as emotional stressors (Zapf, Vogt, Seifert, Mertini & Isic, 1999) are considered. Emotional demands require individuals to express or suppress certain emotions in order to get their job done well (Söderfeldt *et al.*, 1996). In such instances a common non-specific measure of job control may not show the interactive effects predicted by the demand – control model, and new measures of job control to deal with this kind of demand such as emotional control may have to be developed (de Jonge *et al.*, 2000). Consequently, rather than having control over work schedules in general, the most appropriate moderator for the effects of emotional

demands may be emotional control (Zapf *et al.*, 1999). That is, the display rules of emotions should be less prescribed by the organisation in order to devolve emotional control and to buffer the adverse effect of emotional demands.

The present study incorporated 3 different job characteristics – demands, control and support – in order to examine the stressor-strain relationship. However, these job characteristics are not exhaustive (de Jonge *et al.*, 2000; Karasek & Theorell, 1990; Sparks & Cooper, 1999). As almost every occupational group has its own idiosyncratic stressors, other characteristics like work-home interference should be included which may contribute to the detection of interactive effects.

6.11.5 Effects of effort

The results of the questionnaire data and the aggregated diary data indicated largely a main beneficial effect of effort, demonstrating that it is associated with a reduction in strain and health complaints and an increase in job satisfaction and effectiveness. In addition, in the aggregated diary data, a buffering effect of effort was indicated, for the outcome variable of effectiveness and a buffering effect of both effort and resources on demands for the same variable. These results will be considered below.

Several studies (Lundberg & Frankenhaueser, 1980; Rissler, 1977) indicate that the regulation of effort is at least partially under the control of the individual, rather than being an automatic feature of task or environmental conditions (Hockey, 1993).

The above results may indicate the operation of "effortful coping" (Lundberg & Frankenhaeuser, 1980; Frankenhaeuser & Lundberg, 1985) or what Frankenhaeuser (1979) calls "effort without distress". According to the above, effort remains within acceptable limits and is accompanied by positive feelings, provided that the work environment offers

the possibility for control (Meijman & Mulder, 1998). In a study of city bus drivers (Meijman & Kompier, 1998), the individuals in the morning shift were found to operate with "effortful coping" which is characterised with feelings of activation but not feelings of fatigue and tension. The significance of having control over work is illustrated in a laboratory experiment conducted by Zijlstra, Cavalini, Wiethoff & Meijman (1990), which aimed to investigate the relationships between job demands, control, fatigue and effort. They found out that fatigue had a little effect on effort, particularly with a low task load when individuals were allowed to determine their own pace of work.

Overall, the role of control is central in determining the effects of effort. If the individual has no or insufficient possibilities for adequate coping due to the nature of the work task, he may be forced to expend an amount of effort which might be almost entirely beyond his ability and which he is neither emotionally nor motivationally willing to expend. Such a situation generates a pattern of specific physiological and emotional components that may be characterised as stress reaction. What determines the occurrence

or non-occurrence of such a reaction is the possibility of control (Fisher, 1986).

In conclusion, provided there is a possibility for control, thereby preventing the tasks demands from exceeding the possibilities of self-regulation, the effort will remain within limits acceptable to the individual and will not necessarily elicit a tension reaction (Meijman & Mulder, 1998). In a 6-week study of adjustment to daily work demands (Hockey *et al.*, 1996) it was demonstrated that when individuals encountered enabling situations at work, characterised by both high medical demands and control, they engaged in an active mode of coping involving high effort, high energy and increased adrenaline.

Engagement refers to the application of direct, active coping within the limits of the budget. The increased effort allows the protection of performance under demands from

periods of time pressure or unexpected difficulties. Such a mode is manageable as it does not exceed the capabilities of the individual and indicates that individuals are engaged in the task and are working well. It corresponds to Frankenhaueser's description of challenge situations and it is characterised by feelings of enthusiasm and elation (Hockey, 2000).

6.11.6 Conclusion

The questionnaire analysis and the aggregated analysis of the diary data failed to demonstrate substantial support for the interactive hypothesis of the demand – control model. In addition, our findings indicated that individuals adopted an engaged mode of demand management, which is usually associated with a high performance level and high alertness. The following chapter will present the second analytic procedure employed on the diary data and will provide a comparative discussion of the two analytic procedures of the diary data.

CHAPTER 7

WITHIN-INDIVIDUAL ANALYSIS OF THE CROSS-SECTIONAL DATA

7.1 General Introduction

In the previous chapter, the diary data and the questionnaire data were analysed cross-sectionally, in a between-individuals analysis, using two analytic approaches. A conventional between-individuals cross-sectional analysis was performed on the diary data and an aggregated analysis was performed on the diary data. The advantages of aggregated data and potential drawbacks of questionnaire data have been outlined before. In the present chapter, we take full advantage of the diary design of the study in order to conduct a powerful within-individuals analysis.

The focus of the present chapter is to assess the demand – control model cross-sectionally, using a robust analytic procedure, which will be described in detail below.

The analytic procedure that is employed involves attempting to assess the major determinants of variations in daily reports of the outcome variables. Here the focus is on examining how daily stressors (demands), resources and effort and their interactions are associated with shifts in the outcome variables on a given day (Eckenrode, 1984). In this analysis, therefore, the day is the unit of analysis. Although average levels of strain, health complaints may be typically high or low for a person who possesses certain psychological characteristics (e.g. chronic depression), it was expected that daily variations in strain, health complaints and effectiveness would be principally determined by concurrent daily experiences (Eckenrode & Gore, 1981).

The statistical model was based on pooled-time series analysis (Jaccard & Wan, 1993; Pedhazur, 1982; Sayrs, 1989), the dominant statistical approach for daily

experience studies (West & Hepworth, 1991). This technique combines participant cross-sections and time-series (or repeated measures within participants), and employs ordinary regression analyses on the total participants*occasions (I x n) matrix. Its main advantage is the partitioning of explained variance into variance due to persons (cross-sectional), temporal factors (within-persons), and interactions between the two (Zohar, 1999). This controls confounding of between- and within-participants variance, thus increasing analysis sensitivity and enabling the study of time-variant phenomena when relatively small samples are involved (Sayrs, 1989).

The typical approach to repeated measures in regression analysis is to enter I -1 dummy variables (representing I individuals) in the first step of the statistical model, in order to capture variance in the dependent variable which is attributable to individual differences. The difference of such a model from a conventional regression equation is that it is based on a multilevel data array of I individuals, each assessed at n time points. This means that both within-person and between-persons variation play a role in the unrestricted data structure.

The focus of the present analysis, however, was on within-person variation and we aimed to purge the data of the effects of individual difference variables that create between-persons variation. We accomplished this by standardizing the variables (z scores) so that each individual had a standard deviation of 1 and a mean of 0 (Hockey, Maule, Clough & Bdzola, 2000). This procedure removes all between-person effects, leaving only within-person variability and therefore converts the analysis into a study of standardized pooled within-person variation (Kessler, 1987). This is analogous to adjusting observations by each person's mean response on the dependent variable, as performed, for example, in the study of daily mood by Bolger *et al.* (1989). Variables subsequently entered into the statistical model can be tested, therefore, after between-participants variance is removed. This eliminates the possibility of non-constant error

variance, or heteroscedasticity, which is especially relevant when mood and fatigue are the dependent variables, because of individual differences in positive and negative affectivity (Watson, 1988).

An issue of concern in pooled time series is serial dependency, or temporal lag effects (i.e. autocorrelation effects). This may result in potential confounding, since values of the dependent variable on any given day may be affected by its previous states (Bolger *et al.*, 1989). Including previous dependent-variable scores in the regression equation before entering the relevant predictor variables can control serial dependency (Zohar, 1999).

7.2 Data analytic procedures

Standardised pooled analysis entails treating all person-days as a separate quasi-independent analysis, following standardisation within each individual in order to remove individual differences. With 226 respondents and 24 days of diary keeping, 5424 person-days were potentially available for analysis. The exclusion of days that contained missing data resulted in a final sample size of 5380 person-days for the first wave. Similarly, with 141 respondents and 24 diary completion days, 3384 person-days were available for analysis in wave 2. However, a final sample size of 3338 person-days was analysed, after excluding days with missing data.

7.2.1 Correlational analysis

Correlations were computed separately for each data set on both waves. The correlation matrices present the intercorrelations of the variables. *Emotional demands, mental demands, problem-solving demands* and *physical demands* were combined to produce a single measure of *job demands* and *timing control, method control* and *social support* were combined to represent a higher order buffering factor, which has been

called *resources* (Hockey *et al.*, 1996). Similarly, *anxiety, anger, depression* and *fatigue* were combined to produce one measure of *strain*.

7.2.2 Regression analysis

The regression procedure was carried out in six steps. In the first step of the analysis, the corresponding lagged dependent variable was entered in order to control for serial dependency, as noted above. The remaining five steps, following standard analytical procedure, consisted of entering the demand variable (main effect), the resources (control, support) variable (main effect) and the finally the relevant cross-product term (demands x resources: interaction effect). The effort variable was entered in the fifth step and finally in the sixth step, the interactions of effort with demands, of effort with resources and the three-way interaction of demands, resources and effort were entered.

In interpreting the regression analyses, the increment in explained variance (ΔR^2) when entering the independent variable was taken to indicate the effect of that independent variable on the dependent variable (over and above the effects of any independent variables already into the equation). The sign of the regression coefficient was taken to indicate the direction of association between the independent variable and the dependent variable (Ingledew, Hardy & Cooper, 1997).

7.3 Graphical representation of interaction effects

For the standardised pooled diary data, demands and resources were classified into quartiles in order to represent four levels of demands and resources respectively. A 4-point graph was then plotted indicating the levels of resources (very low, low, high, very high) in relation to the level of demands (very low, low, high, very high) and the outcome measure. The 4-point graph was selected in the standardised pooled analysis

due to the large amount of points involved in the analysis, as it gives a clearer picture of the data than the conventional 2-point graph usually used. It should be noted that graphs were only plotted for the statistically significant interactive effects of demands and resources on the relevant outcome variables.

7.4 (a) Diaries – Standardised Pooled Analysis – Wave 1

The correlation and regression analyses were conducted on the 226 individuals that completed the diaries for 24 days in wave 1. As previously noted, the final sample size comprised 5380 person-days for analysis.

7.4.1 (a) Correlation analysis

Table 7.1: Correlation matrix of the variables – ***Pooled data*** – (n = 5380)

Variables	*LSTR*	*LHC*	*LEFC*	*DEM*	*RES*	*EFR*	*STR*	*HC*
Lagged health complaints (LGHC)	.34**							
Lagged effectiveness (LEFC)	-.23**	-.20**						
Demands (DEM)	.05**	.01	.03*					
Resources (RES)	-.04**	.00	.07**	.02				
Effort (EFR)	.01	.02	.02	.14**	-.04**			
Strain (STR)	.15**	.10**	-.05**	.15**	-.19**	.08**		
Health complaints (HC)	.08	.26**	-.04**	.07**	-.09**	.08**	.34**	
Effectiveness	-.04	-.03**	.06**	.06**	.16**	.05**	-.23**	-.20**

Note 1: All the above variables are standardised (z scores): SD = 1 Mean = 0
Note 2: LSTR (Lagged strain)
* $p < .05$ ** $p < .01$

Looking at the above correlation matrix, most of the variables are intercorrelated. It is not surprising that correlations are significant, due to the immense

power of this analysis. However only some of these correlations are meaningful and these will be briefly discussed below. We adopted the level of $r \geq .15$ as a meaningful level for discussion.

Demands showed a small correlation only with strain ($r = .15, p < .01$), indicating detrimental effects of demands. On the other hand, a small correlation of resources with strain ($r = -.19, p < .01$) and with effectiveness ($r = .16, p < .01$), both in the hypothesised theoretical direction. Lagged strain showed small to moderate correlations with lagged health complaints ($r = .34, p < .01$), lagged effectiveness ($r = -.23, p < .01$) and strain ($r = .15, p < .01$), in the expected theoretical direction. Lagged health complaints correlated strongly with lagged effectiveness ($r = -.20, p < .01$) and health complaints ($r = .26, p < .01$), as expected.

7.4.2 (a) Regression analysis

Table 7.2: Summary of the moderated regression analysis – Pooled data (a) – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged strain**	.022	.022	.148***	< .001
2.	**Demands**	.043	.021	.144***	< .001
3.	**Resources**	.077	.034	-.185***	< .001
4.	**Demands x Resources**	.078	.001	-.031*	< .05
5.	**Effort**	.081	.003	.057***	< .001
6.	**Demands x Effort**	.081	.000	.015	ns
	Effort x Resources			-.005	ns
	Demands x Resources x Effort			-.014	ns

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

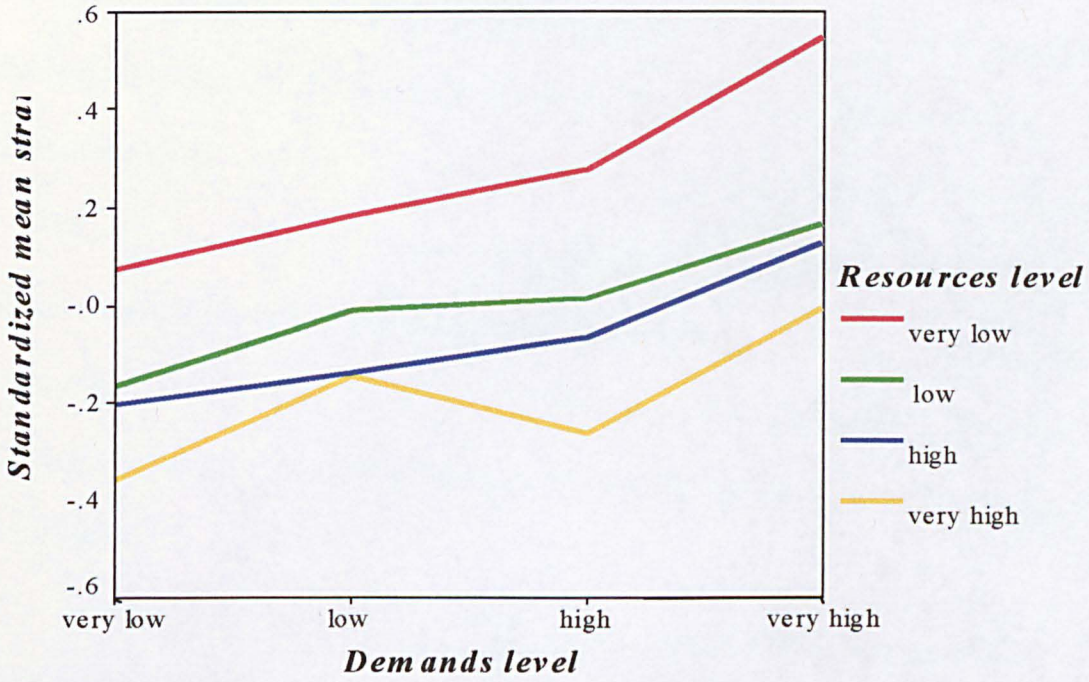

Figure 7.1: Strain as a function of joint effects of demands and resources –Wave 1

The results of the hierarchical multiple regression analysis on the disaggregated diary data in which person-days are the units of analysis are shown in Table 7.2. The above model states that strain on a given day is predicted by demands, resources, their interaction and effort and its interactive effects with demands and resources on that day and, additionally, by strain on the previous day. By the inclusion of the lagged dependent variable, this analysis focuses on the determinants of change in strain.

Table 7.2 presents the increments of R^2 and standardised beta coefficients. Lagged strain accounted for a significant 2.2 % of the variance in strain ($\beta = .148$, $F = 120.588$, $p < .001$), indicating, as expected that strain on the previous day increases strain in the day and thus justifying the inclusion of lagged strain in the equation, in order to control for its effects. Looking at the two main effects, demands accounted for a small but significant 2.1 % of the variance in strain ($\beta = .144$, $F = 116.776$, $p < .001$) and resources accounted for a significant 3.4 % of the variance in strain ($\beta = -.185$, $F = 199.106$, $p < .001$), both in the direction expected from theory.

An additional interesting finding, and one that is most important for the test of the demand-control model, is that the interactive effects of demands and resources account for a very small but significant increase in the variance in strain ($\Delta R^2 = .001$, F = 5.484, $p < .05$). The negative sign of the regression coefficient ($\beta = -.031$, $p < .05$) indicates that the interaction is congruent with the demand-control theory, postulating a suppressing effect of resources. Although difficult to see from the graph (Figure 7.1), there is a progressive reduction in the demands-strain slope as resources increase from low to high.

Looking at the main effects of effort, effort accounted for a very small but significant increase in the variance in strain ($\Delta R^2 = .003$, F = 18.597, $p < .001$). The standardised Beta coefficient ($\beta = .057$, $p < .001$) indicates detrimental effects of effort and this finding will be considered later on.

Table 7.3: Summary of the moderated regression analysis – Pooled data (a) – ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged health complaints**	.067	.067	.258***	< .001
2.	**Demands**	.071	.005	.068***	< .001
3.	**Resources**	.080	.008	-.092***	< .001
4.	**Demands x Resources**	.081	.002	-.042**	< .01
5.	**Effort**	.085	.004	.060***	< .001
6.	**Demands x Effort**	.086	.001	.020	ns
	Effort x Resources			-.024†	= .07
	Demands x Resources x Effort			.007	ns

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ ** $p < .01$ *** $p < .001$

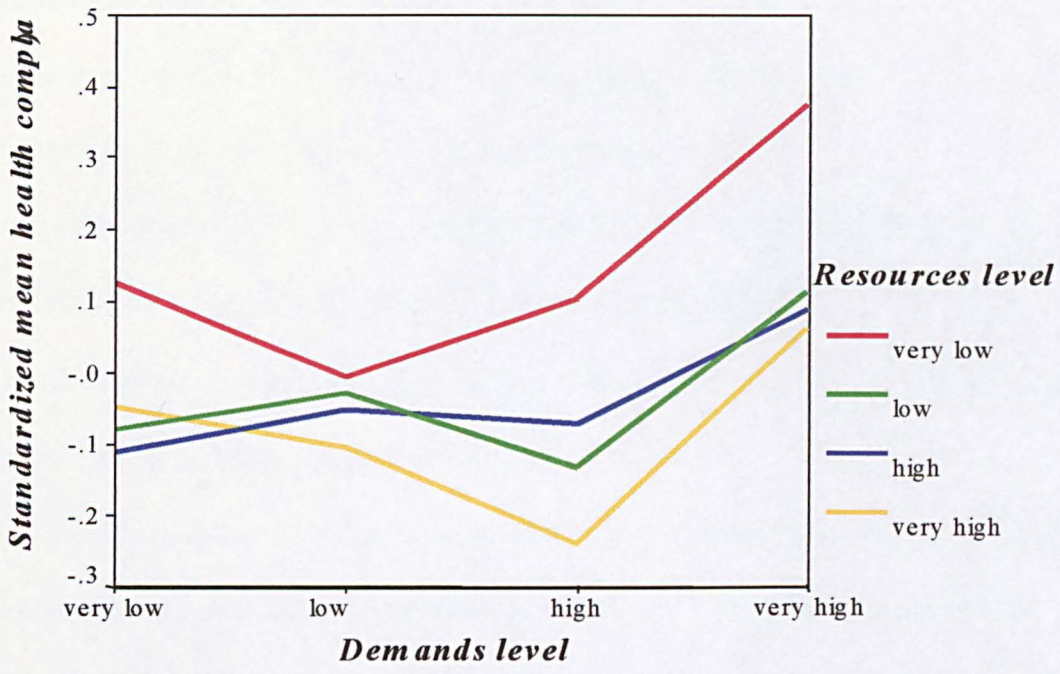

Figure 7.2: Health complaints as a function of joint effects of demands and resources – Wave 1

Looking at Table 7.3, a highly significant effect of the previous day's health complaints on the next day's health complaints was found, as expected. Lagged health complaints accounted for a significant 6.7 % of the variance in health complaints (β = .258, F = 382.706, $p < .001$).

Demands also accounted for a small but significant increase in the variance in health complaints (ΔR^2 = .005, F = 26.493, $p < .001$). Looking at the regression coefficient (β = .068, p < .001), demands are associated with an increase in strain, as is well documented in the literature. Additionally, resources accounted for a small but significant variance in strain (ΔR^2 = .008, F = 49.062, $p < .001$). The standardised Beta coefficient indicates beneficial effects of resources (β = -.092, $p < .001$).

More fundamentally, the interaction of demands and resources accounted for a very small but significant increase in the variance in health complaints (ΔR^2 = .002, F = 10.070, $p < .01$). The sign of the regression coefficient indicates a negative interaction (β = -.042, $p < .01$), thus being consistent with the demand – control model that

hypothesises a buffering effect of resources. Looking at the graph (Figure 7.2), it is impossible to see the indicated interaction. This suggests that there may be a curvilinear component in these relationships, at low resources in particular.

Effort accounted for a very small but significant increase in the variance in health complaints as indicated by the increment in R^2 ($\Delta R^2 = .004$, $F = 20.887$, $p < .001$). The regression coefficient ($\beta = .060$, $p < .001$) demonstrates a negative impact of effort, a result that will be considered later on.

Finally, a noteworthy finding is the marginally significant interactive effect of effort and resources on health complaints ($\beta = -.024$, $p = .07$). This is an interesting result as it suggests that high resources reduce the effects of effort on health complaints, thus demonstrating a suppressing effect of resources.

Table 7.4: Summary of the moderated regression analysis – Pooled data (a) – ***Effectiveness***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged effectiveness**	.003	.003	.055***	< .001
2.	**Demands**	.006	.003	.055***	< .001
3.	**Resources**	.033	.026	.163***	< .001
4.	**Demands x Resources**	.033	.001	-.025†	= .06
5.	**Effort**	.035	.002	.045**	< .01
6.	**Demands x Effort**	.037	.002	.036**	< .01
	Effort x Resources			.010	ns
	Demands x Resources x Effort			-.012	ns

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ ** $p < .01$ *** $p < .001$

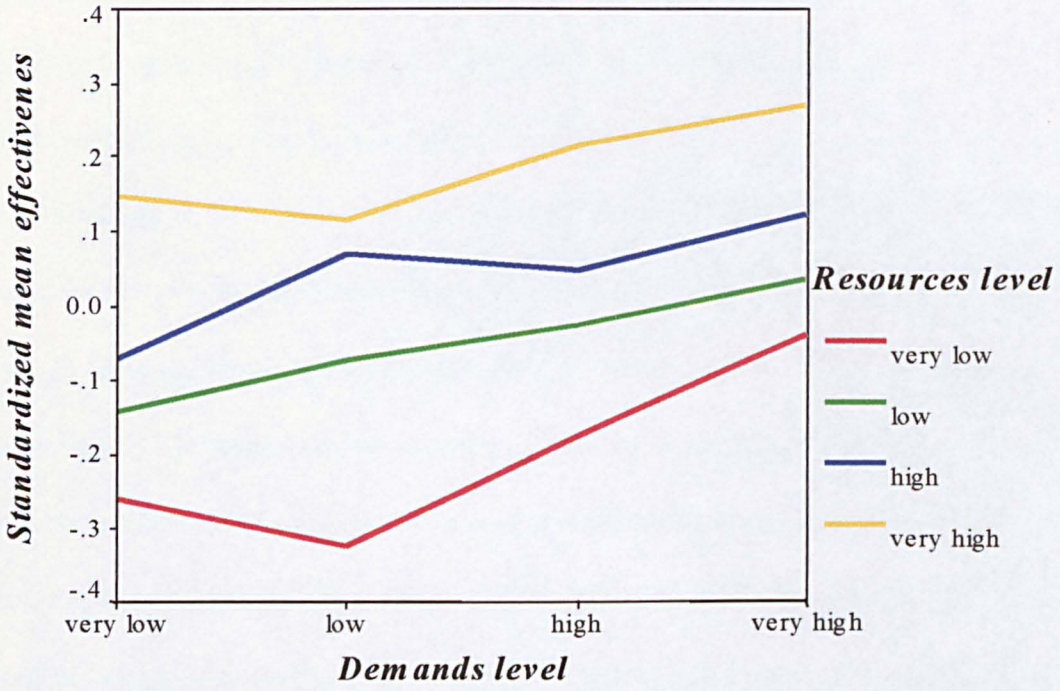

Figure 7.3: Effectiveness as a function of the joint effects of demands and resources- Wave 1

Looking at the outcome variable of effectiveness, lagged effectiveness accounted for a very small but significant increase in the variance in effectiveness (ΔR^2 = .003, F = 15.997, p < .001). The standardised Beta coefficient (β = .055, p < .001) indicates, as expected, that effectiveness in the previous day results in an increase in effectiveness the next day. Similarly, demands accounted for a very small but significant increase in the variance in effectiveness (ΔR^2 = .003, F = 16.428, p < .001). The regression coefficient (β = .055, p < .001) demonstrates a positive impact of demands, thus being inconsistent with the reported evidence. In addition, resources accounted for a significant 2.6 % of the variance in effectiveness (β = .163, F = 145.954, p < .001), indicating beneficial effects of resources.

The marginally significant interactive effect of demands and resources on effectiveness is worth noting (β = -.025, F = 3.559, p = .06). Of particular interest is the sign of the regression coefficient, suggestive of a suppressing effect of resources.

As illustrated in Figure 7.3, there are systematic effects of resources on effectiveness. In particular, there is a systematic reduction in the demands – effectiveness slope, as resources increase from low to high.

Looking at the effects of effort, effort accounted for a very small but significant increase in the variance in effectiveness ($\Delta R^2 = .002$, $F = 10.760$, $p < .01$). The sign of the standardised Beta coefficient ($\beta = .045$, $p < .01$) shows that effort increases effectiveness. This finding will be considered later on. An additional interesting result is that the interaction of demands and effort accounted for a very small but significant increase in the variance in effectiveness ($\Delta R^2 = .002$, $F = 2.779$, $p < .05$). However, the sign of the regression coefficient ($\beta = .036$, $p < .01$) indicates an enhancing effect of effort, in that high effort increases the effects of demands on effectiveness.

7.4.3 (a) Summary of wave 1 standardised pooled analysis

The results of the present analysis demonstrated statistically significant main effects of both demands and resources on all the outcome variables. Consistent with theory, the results indicated detrimental effects of demands and beneficial effects of resources. More important in terms of the test of the demand – control model, interactive effects of demands and resources were sound for two out of the three outcome variables. However, even for the outcome variable of effectiveness, a marginally significant interactive effect was found. The direction of the interaction demonstrated buffering effects of resources and thus coincided with theory.

Moreover, significant main effects of effort on all the outcome variables were found. However, although for the outcome variables of strain and health complaints effort indicated negative effects, for the outcome variable of effectiveness it indicated positive effects. Finally, a significant enhancing effect of effort on demands for the

outcome variable of effectiveness and a marginally significant buffering effect of resources on effort for the outcome variable of health complaints are worth noting.

7.4 (b) Diaries – Standardised Pooled Analysis – Wave 1

As with the previous analysis, the stability of the results was tested by conducting the regression on the individuals that completed the questionnaires on both waves, after removing the participants that did not complete the questionnaires on the wave 2. 141 individuals remained that completed the questionnaires on both waves. As previously discussed, the pooled analysis involves person-days, therefore the 141 participants that completed the diaries for 24 days resulted in 3375 person-days. The results of this analysis are presented below.

7.4.1 (b) Correlation analysis

Table 7.5: Correlation matrix of the variables – ***Pooled data*** – (n = 3375)

Variables	*LSTR*	*LHC*	*LEFC*	*DEM*	*RES*	*EFR*	*STR*	*HC*
Lagged health complaints (LGHC)	.42**							
Lagged effectiveness (LEFC)	-.24**	-.23**						
Demands (DEM)	.05**	.01	.04*					
Resources (RES)	-.04**	.01	.09**	.01				
Effort (EFR)	.03	.05**	.01	.16**	-.09**			
Strain (STR)	.16**	.11**	-.05**	.19**	-.21**	.12**		
Health complaints (HC)	.10**	.25**	-.04*	.08**	-.11**	.10**	.42**	
Effectiveness	-.04*	-.03	.06**	.07**	.20**	.04*	-.24**	-.23**

Note 1: All the above variables are standardised (z scores): SD = 1 Mean = 0
Note 2: LSTR (Lagged strain)
* $p < .05$ ** $p < .01$

Looking at the table above, as previously noted, most of the correlations are significant as this is a powerful analysis. Therefore, only the correlations that are at the level of $r \geq .15$ will be considered. Lagged strain indicated moderate to strong correlations to lagged health complaints ($r = .42, p < .01$), lagged effectiveness ($r = -.24$, $p < .01$) and strain ($r = .16, p < .01$), as expected. Moderate positive correlations of demands with effort ($r = .16, p < .01$) and strain ($r = .19, p < .01$) were also found. Resources correlated with strain ($r = -.21, p < .01$) and effectiveness ($r = .20, p < .01$), in the hypothesised theoretical direction. Looking briefly at the dependent variables, they showed moderate to strong intercorrelations in a direction consistent with theory.

7.4.2 (b) Regression analysis

Table 7.6: Summary of the moderated regression analysis – Pooled data (b) – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged strain**	.026	.026	.161***	< .001
2.	**Demands**	.059	.033	.181***	< .001
3.	**Resources**	.102	.044	-.209**	< .01
4.	**Demands x Resources**	.103	.001	-.099†	= .06
5.	**Effort**	.108	.004	.067***	< .001
6.	**Demands x Effort**	.111	.003	.026	ns
	Effort x Resources			.016	ns
	Demands x Resources x Effort			-.051**	< .01

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ ** $p < .01$ *** $p < .001$

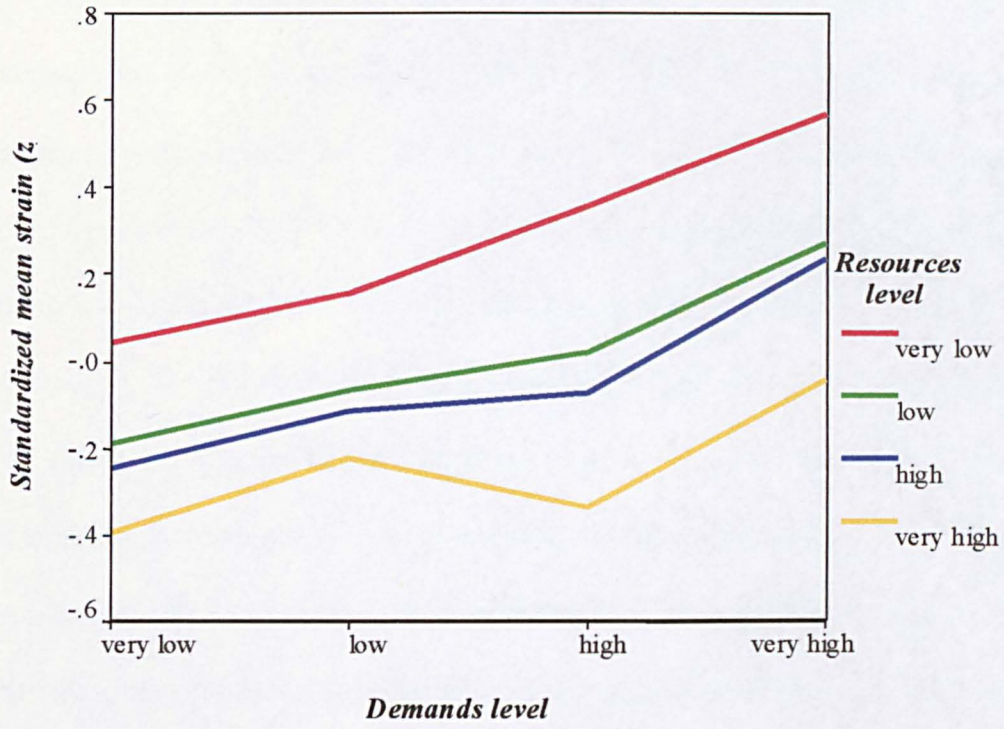

Figure 7.4: Strain as a function of joint effects of demands and resources – Wave 1

Looking at table 7.6, lagged strain accounted for a small but significant 2.6 % of the variance in strain ($\beta = .161$, $F = 89.823$, $p < .001$). The sign of the standardized Beta coefficient indicates that strain in the previous day is associated with an increase in strain in the next day, as expected. In addition, demands accounted for a significant 3.3 % of the variance in strain ($\beta = .181$, $F = 116.654$, $p < .001$). According to the above, job demands increase strain, a result that is well-documented in the literature. Resources also accounted for a significant 4.4 % of the variance in strain ($\beta = -.209$, $F = 164.161$, $p < .01$). This finding indicates beneficial effects of resources, as resources are associated with a reduction in strain.

A marginally significant interactive effect of demands and resources on strain ($\beta = -.099$, $p = .06$) is worth noting. The result is congruent with theory as it indicates that high resources reduce the effects of demands on strain, thereby demonstrating suppressing effects of resources.

Looking at the effort variable, effort accounted for a very small but significant increase in the variance in strain ($\Delta R^2 = .004$, $F = 16.344$, $p < .001$). The sign of the regression coefficient ($\beta = .067$, $p < .001$) indicates that effort increases strain and implies detrimental effects of effort. Finally, the interactions of demands and effort, resources and effort and the 3-way interaction of demands, resources and effort accounted for a very small but significant increase in the variance in strain ($\Delta R^2 = .003$, $F = 4.158$, $p < .01$). A statistically significant interactive effect of demands, resources and effort on strain was also found ($\beta = -.051$, $p < .01$). According to this finding, high resources and effort reduce the effects of demands on strain. This demonstrates suppressing effects of resources and effort and is therefore consistent with theory.

Figure 7.4, illustrates the systematic effects of resources on strain. Specifically, there is a reduction in the demands – strain slope as resources increase from low to high.

Table 7.7: Summary of the moderated regression analysis – Pooled data (b) – ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged health complaints**	.062	.062	.249***	< .001
2.	**Demands**	.068	.006	.077***	< .001
3.	**Resources**	.080	.012	-.108***	< .001
4.	**Demands x Resources**	.080	.000	-.038	ns
5.	**Effort**	.084	.005	.070***	< .001
6.	**Demands x Effort**	.087	.003	.023	ns
	Effort x Resources			-.041*	< .05
	Demands x Resources x Effort			-.016	ns

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

As can be seen on Table 7.7, lagged health complaints accounted for a significant 6.2 % of the variance in health complaints ($\beta = .249$, $F = 223.060$, $p < .001$). As expected, health complaints of the previous day were associated with an increase in health complaints in the next day. Additionally, demands accounted for a very small but

significant increase in the variance in health complaints (ΔR^2 = .006, F = 21.209, p < .001). The sign of the regression coefficient (β = .077, p < .01) indicates, as expected, that job demands increase health complaints. Resources also accounted for a small but statistically significant 1.2 % of the variance in health complaints (β = -.108, F = 42.784, p < .001). This result is congruent with theory as it indicates beneficial effects of resources. Rather unexpectedly, there were no significant interactive effects of demands and resources on health complaints.

Effort, on the other hand, accounted for a very small but significant increase in the variance in health complaints (ΔR^2 = .005, F = 17.389, p < .001). Looking at the standardised Beta coefficient (β = .070, p < .001), it shows negative effects of effort, as it is associated with an increase in health complaints. Finally, the interactions of demands with effort, effort with resources and the three-way interaction of demands, resources and effort accounted for a very small but significant increase in the variance in health complaints (ΔR^2 = .003, F = 3.165, p < .05). The sign of the regression coefficient (β = - .041, p < .05) for the interaction of effort with resources indicates that high resources reduce the effects of effort on health complaints. This is consistent with theoretical expectations as it demonstrates suppressing effects of resources.

Table 7.8: Summary of the moderated regression analysis – Pooled data (b) – ***Effectiveness***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged effectiveness**	.004	.004	.063***	< .001
2.	**Demands**	.008	.004	.060***	< .001
3.	**Resources**	.047	.040	.200***	< .001
4.	**Demands x Resources**	.047	.000	.016	ns
5.	**Effort**	.049	.002	.046**	< .01
6.	**Demands x Effort**	.050	.001	.030†	= .08
	Effort x Resources			-.013	ns
	Demands x Resources x Effort			.000	ns

Note: the Table shows standardised β weights for each step of the analysis.
† p < .10 ** p < .01 *** p < .001

Table 7.8 indicates that lagged effectiveness accounted for a very small but statistically significant increase in the variance in effectiveness ($\Delta R^2 = .004$, F = 13.232, $p < .001$). The regression coefficient ($\beta = .063, p < .001$) demonstrates that effectiveness in the previous day is associated with an increase in effectiveness in the next day. In addition, demands accounted for a very small but significant increase in the variance in effectiveness ($\Delta R^2 = .004$, F = 12.167, $p < .001$). The sign of the standardised Beta coefficient ($\beta = .060, p < .001$) indicates that demands are associated with an increase in effectiveness, thus demonstrating beneficial effects of demands. Moreover, resources accounted for a small but significant 4 % of the variance in effectiveness ($\beta = .200$, F = 138.634, $p < .001$). According to this result resources increase effectiveness and this is consistent with a wide literature that documents beneficial effects of resources.

Effort also accounted for a very small but statistically significant increase in the variance in effectiveness ($\Delta R^2 = .002$, F = 7.312, $p < .01$). The sign of the regression coefficient ($\beta = .046, p < .01$) indicates that effort increases effectiveness, thereby suggesting a positive impact of effort. A marginally significant interactive effect of demands and effort on effectiveness is worth noting ($\beta = .030, p = .08$). This finding suggests that high effort enhances the effects of demands on effectiveness and therefore indicates negative effects of resources.

7.4.3 (b) Summary of wave 1 standardised pooled analysis

Looking at the findings of this second pooled analysis of the diary data, main effects of both demands and resources were demonstrated and these were consistent with the ones of the first analysis. Rather unexpectedly though, beneficial effects of demands were indicated for the outcome variable of effectiveness. In this analysis, however, the interactive effects previously found were lost. Only a marginally significant interactive effect of demands and resources on strain was found, in the

hypothesised direction. In addition, consistent with the results of the first analysis, detrimental effects of effort were found for the outcome variables of strain and health complaints and a positive impact of effort was indicated for the outcome variable of effectiveness. Moreover, a suppressing effect of resources and effort on demands for strain and a suppressing effect of resources on effort for health complaints were observed. Finally, a marginally significant enhancing effect of effort on demands for the effectiveness variable is worth noting.

7.5 Diaries – Standardised Pooled Analysis – Wave 2

Correlational and moderated regression analyses were conducted on the aggregated diary data from Wave 2. The analyses were carried out on the 141 individuals that completed the diaries for 24 days on the second wave. The final sample size consisted of 3338 person-days.

7.5.1 Correlation analysis

Table 7.9: Correlation matrix of the variables – **Pooled data** – (n = 3338)

Variables	*LSTR*	*LHC*	*LEFC*	*DEM*	*RES*	*EFR*	*STR*	*HC*
Lagged health complaints (LHC)	.15**							
Lagged effectiveness (LEFC)	-.07**	-.14**						
Demands (DEM)	-.00	.01	.00					
Resources (RES)	-.05**	-.01	.04*	.03				
Effort (EFR)	.01	-.01	-.01	.08**	-.03			
Strain (STR)	.12**	.04**	-.04*	.07**	-.13**	.04*		
Health Complaints (HC)	.04**	.46**	-.01	.01	-.07**	.04*	.15**	
Effectiveness (EFCT)	-.03	-.04**	.06**	.08**	.10**	.01	-.07**	-.14**

Note 1: All the above variables are standardised (z scores): SD = 1 Mean = 0
Note 2: LSTR (Lagged strain)
* $p < .05$ ** $p < .01$

Looking at the correlation matrix, the demands measures showed positive correlations with two of the outcome variables, strain ($r = .07, p < .01$) and effectiveness ($r = .08, p < .01$). In addition, demands correlated positively with effort ($r = .08, p < .01$), indicating that job demands increase effort, a result that is not unexpected. On the other hand, a positive correlation of demands with effectiveness was found ($r = .08, p < .01$), indicating that job demands increase effectiveness. Furthermore, resources showed moderate negative correlations with strain ($r = -.13, p < .01$) and health complaints ($r = -.07, p < .01$), as expected, demonstrating beneficial effects of resources. Additionally, a positive correlation of resources with effectiveness ($r = .10, p < .01$) was observed. Positive correlations of effort with strain ($r = .04, p < .01$) and health complaints ($r = .04, p < .01$) were also found, indicating a detrimental effect of effort.

7.5.2 Regression analysis

Table 7.10: Summary of the moderated regression analysis – Pooled data – ***Strain***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged strain**	.014	.014	.117***	< .001
2.	**Demands**	.019	.005	.073***	< .001
3.	**Resources**	.035	.016	-.127***	< .001
4.	**Demands x Resources**	.035	.000	.001	ns
5.	**Effort**	.036	.001	.029	ns
6.	**Demands x Effort**	.037	.001	.005	ns
	Effort x Resources			-.016	ns
	Demands x Resources x Effort			-.030†	= .08

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ *** $p < .001$

In the examination of the strain variable, lagged strain accounted for a small but significant 1.4 % of the variance in strain ($\beta = .117$, $F = 46.596$, $p < .001$), indicating that strain experienced on the previous day increases strain on the next day, as expected.

Looking at the main effects, the demands variable accounted for a very small but significant increase in the variance in strain ($\Delta R^2 = .005$, $F = 17.968$, $p < .001$). The standardized regression coefficient ($\beta = .073$, $p < .001$) demonstrates detrimental effects of demands and is thus consistent with theory. Similarly, resources accounted for a small but significant 1.6 % of the variance in strain ($\beta = -.127$, $p < .001$), as expected. Surprisingly, no significant interactive effects of demands and resources on strain have been found.

In addition, effort did not show any significant main effects or interactive effects on strain. A noteworthy result is the marginally significant interactive effect of demands, resources and effort on strain ($\beta = -.030$, $p = .08$). The sign of the regression coefficient indicates that, not unexpectedly, high demands and high effort reduce the effects of demands on strain, thus demonstrating a suppressing effect of resources and effort.

Table 7.11: Summary of the moderated regression analysis – Pooled data – ***Health complaints***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged health complaints**	.214	.214	.462***	< .001
2.	**Demands**	.214	.000	.009	ns
3.	**Resources**	.218	.004	-.067***	< .001
4.	**Demands x Resources**	.218	.000	-.004	ns
5.	**Effort**	.220	.002	.041**	< .01
6.	**Demands x Effort**	.223	.003	.050**	< .01
	Effort x Resources			.011	ns
	Demands x Resources x Effort			-.002	ns

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

As can be seen on Table 7.11, lagged health complaints accounted for a significant 21.4 % of the variance in health complaints ($\beta = .462$, $F = 906.914$, $p < .001$). As was expected, health complaints on the previous day are major predictors of

health complaints on the next day. On the other hand, no significant effect of demands on health complaints was observed. However, resources accounted for a very small but significant increase in the variance in health complaints ($\Delta R^2 = .004$, $F = 19.190$, $p < .001$). The standardised Beta coefficient ($\beta = -.067$, $p < .001$) indicates positive effects of resources, a finding that is well documented in the literature. No significant interactive effects of demands and resources on health complaints were demonstrated.

Looking at the effects of effort, effort accounted for a very small but significant increase in the variance in health complaints ($\Delta R^2 = .002$, $F = 7.185$, $p < .01$). The sign of the regression coefficient ($\beta = .041$, $p < .01$) indicates negative effects of effort. This finding will be considered later on. More fundamentally, however, the interaction of demands with effort accounted for a very small but significant increase in the variance in health complaints ($\Delta R^2 = .003$, $F = 3.712$, $p < .05$). However, looking at the sign of the regression coefficient ($\beta = .050$, $p < .01$), high effort seemed to increase the effects of demands on health complaints.

Table 7.12: Summary of the moderated regression analysis – Pooled data – ***Effectiveness***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Lagged effectiveness**	.003	.003	.056**	< .01
2.	**Demands**	.010	.007	.085***	< .001
3.	**Resources**	.020	.010	.098***	< .001
4.	**Demands x Resources**	.020	.000	.004	ns
5.	**Effort**	.020	.000	.010	ns
6.	**Demands x Effort**	.021	.001	-.031†	= .08
	Effort x Resources			.013	ns
	Demands x Resources x Effort			.017	ns

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ ** $p < .01$ *** $p < .001$

Examining the effectiveness variable, previous day's effectiveness accounted for a small but significant increase in the variance in the next day's effectiveness ($\Delta R^2 =$

.003, F = 10.492, $p < .01$), as was expected. Looking at the main effects of demands and resources, demands accounted for a very small but significant increase in the variance in effectiveness ($\Delta R^2 = .007$, F = 24.089, $p < .001$). The standardized Beta coefficient (β = .085, $p < .001$) indicates, rather unexpectedly, beneficial effects of demands. Moreover, resources accounted for a small 1 % of the variance in effectiveness (β = .098, F = 32.610, $p < .001$), demonstrating that resources increase effectiveness, a finding that is congruent with theoretical expectations.

More importantly, a marginally significant interactive effect of demands and effort on effectiveness was observed (β = -.031, p = .08). According to this result, high effort reduces the effects of demands on effectiveness, thus indicating positive effects of effort. This result will be discussed further.

7.5.3 Summary of wave 2 standardised pooled analysis

The results of the standardised pooled analysis of the diary data for the second wave indicated statistically significant main effects of demands for strain and effectiveness, demonstrating a negative impact of demands. In addition, main effects of resources on all the outcome variables were observed, in a direction that was congruent with theory. Rather surprisingly, however, and in contrast to wave 1, no statistically significant interactive effects of demands and resources on any of the outcome variables were found. Effort indicated negative effects only for the health complaints variable. An enhancing effect of effort on demands is also worth noting. Finally, a marginally significant suppressing effect of both resources and effort on demands for the strain variable and a marginally significant suppressing effect of effort on demands for the effectiveness variable should be mentioned.

7.6 Overview of the findings of the standardised pooled analysis

Overall, the results of the standardised pooled analysis provided partial support for the interactive hypothesis of the demand – control model. All of the observed interactions indicated a buffering effect of resources, therefore being congruent with theoretical expectations. Statistically significant main effects of demands and resources were also found for most of the outcome variables. These main effects demonstrated detrimental effects of demands and beneficial effects of resources. In addition, effort indicated statistically significant main effects for several outcome variables, indicating an overall negative impact of effort. An exception is the finding of the main effect of effort on effectiveness, which indicated that effort increases effectiveness.

In conclusion, although the findings of the pooled analysis of the diary data for wave 1 provided good support of the demand – control model, in the analysis of the data for wave 2, the interactive effects were lost. Similarly, statistically significant effects of several variables that were observed in wave 1 were not found in wave 2. This will be considered later on.

7.7 Discussion

7.7.1 Overview

As outlined earlier, two different analytic procedures were conducted on the data obtained from the diaries in order to examine the demand – control model more thoroughly. In the previous chapter we presented and discussed the results of the aggregated between-individuals analysis of the diary data. The purpose of the present discussion is twofold. First we will consider the findings of the within-individual analysis, followed by a comparative discussion of the two different analytic approaches to the diary data.

The diary data were further exploited by conducting standardised pooled analysis, sometimes referred to as disaggregated analysis (Eckenrode, 1984). As mentioned earlier, standardised pooling refers to within-person analysis after removing between- persons variance. Uncommonly strong conclusions can be drawn when the sequencing of variables is analysed within persons over time. Additionally, this analysis provides criteria for causal inference by establishing association and temporal precedence and by ruling out some forms of spuriousness (Affleck, Tennen, Urrows & Higgins, 1994; West & Hepworth, 1991). Finally, by the measurement of the processes under consideration closer to their "real time" occurrences or moments of change, errors from faulty memory and retrospection bias can be minimised.

It should be noted that the above approach is rarely used for testing the demand – control model. However, we believe it will give us interesting insights in the processes involved, as it preserves the immediacy of effects of the main variables.

Looking at the results of the standardised pooled analysis of the diary data, an entirely different picture than the one indicated from the aggregated diary data emerges. First, the results of the correlational analysis were congruent with theoretical expectations. However, the size of the correlations observed was quite small and this will be considered further. Moreover, the moderated regression analysis revealed statistically significant main effects of demands and resources for all the outcome variables for both waves. An exception was the lack of a significant main effect of demands on health complaints for wave 2. In terms of the test of the demand – control model, statistically significant interactive effects were found for all the outcome variables in wave 1 but for none of the outcome variables in wave 2. Thus, three out of the six interactive effects tested in the standardised pooled analysis were statistically significant. The significant interaction terms represent 50 % of the interactions tested, thus indicating moderate support for the demand – control model. The support for the

model, however, is quite meaningful, because the statistically significant interactions were found in a powerful within-person analysis. As previously noted, this approach preserves the temporal relations between the variables by focusing on a given day as the unit of analysis.

The small amount of variance that was observed in the interaction term in the pooled analysis deserves some comment. It should be noted that the R^2 increment for the interaction term was measured after the lagged dependent variable and the linear and single effect of demands and resources were introduced into the hierarchical regression analysis, which would reduce the impact of the interaction term on the dependent variable and would thus result in a small amount of explained variance (Frese, 1999). This point will be considered further.

As noted above, the results of the standardised pooled analysis indicate the presence of significant main effects of both demands and resources. A discussion on main effects of demands and resources has been provided so it will not be repeated here. However, an interesting 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, health complaints and effectiveness at average levels of control or social support.

Overall, the findings of an additive model are consistent with other research in relatively homogeneous samples (Beehr & Drexler, 1986; Hurrell & McLaney, 1989; Payne & Fletcher, 1983; Perrewe & Anthony, 1990). Given the observed main effects, the results of the pooled analysis can be considered good support for an additive demand – control model.

The main hypothesis of the study, however, was the presence of significant interactive effects of demands and resources on the outcome variables. As noted before, the results demonstrated partial support for the model. The findings on the interactive effects are consistent with several single occupation-based studies which found similar interaction effects of job demands and job control (de Jonge *et al.*, 2000; Fox, Dwyer & Ganster, 1993; Landsbergis *et al.*, 1992; Parkes, Mendham & von Rabenau, 1994).

The fact that the results in support of the demand – control model are based on pooled within-person analyses is significant. Results of this sort are much more powerful and convincing than results based on cross-sectional data which focus in between-persons analyses and even than results based on unrestricted analyses of pooled diary data as they combine both within-person and between-persons variance. As previously noted, the data were standardized before being "pooled", therefore removing the confounding influences of individual differences. Although several researchers have consistently distinguished these sources of variance, this practice has not become standard in the literature (Bolger *et al.*, 1989). Therefore, the present results highlight the significance of removing the effect of individual differences in the examination of the demand – control model, a point that is novel in the existing literature.

The disaggregated analysis was conducted in order to provide a more accurate test of the strength of the relationships between daily demands, resources and effort and daily changes in strain, health complaints and effectiveness. By the inclusion of the lagged dependent variable the purpose of this analysis is highlighted: to indicate the changes in strain, health complaints and effectiveness, as a function of the concurrent job demands, resources and effort.

A further point should be addressed: the contemporaneous main and interactive effects found between demands, effort, resources and the outcome variables suggest that

processes operating within a day may be equally or more important to capture than those operating across days.

As previously noted, a disaggregated approach preserves temporal relationships and thus focuses on the analysis of the determinants of change in well-being. As Eckenrode (1984) argued "disaggregated analysis yields more valid results concerning the direction and magnitude of the daily relationships than the aggregated analysis" (p.916). Given the emerging evidence on the significance of daily processes in stress and health, these findings provide useful insights to a model that is widely applicable and influential and that, to our knowledge, has never been studied in such a framework.

Tennen & Affleck (1996) have pointed out 2 specific data analytic advantages of such an approach: firstly, a within-person design removes potential sources of between-persons confounding by stable dispositions or situations. In addition, these designs maintain temporal sequences of events and outcomes and the establishment of temporal precedence strengthens causal inferences (West & Hepworth, 1991).

A common criticism of self-report data is that effects may be due to individual differences in reporting. Our within-person analytic strategy, however, alleviated the effect of differences in reporting, because each subject served as his or her own control (West & Hepworth, 1991). Thus, the pooled time-series analysis enables the study of time-dependent phenomena while removing response bias as a source of error in self-report data (Sayrs, 1989; Zohar, 1999).

In summary, the within-individual analytic procedure provided partial support for the demand – control model, a finding that is novel in the literature and that points towards a new future research direction. It is evident that the standardized pooled analysis has a number of methodological advantages that increase its powerfulness, reliability and validity and the present results should be considered in the light of these

advantages. The interesting implications of such findings will be discussed in detail in chapter 9.

Looking at the findings on effort, a largely detrimental effect of effort was observed, as the variable was associated with an increase in health complaints and strain. On the other hand, effort was associated with an increase in effectiveness. The above findings indicate that individuals operated in the strain mode of demand management (Hockey, 2000). This corresponds to Frankenhaueser's (1979) notion of "effort with distress". This mode is associated with increased anxiety and fatigue and performance under such a mode usually reaches acceptable levels. The latter coincides with the results that indicated that effort resulted in an increase in effectiveness and confirms the suggestion that individuals were in fact employing the strain mode of managing demands.

Thorndike (1914) pointed out that individuals are able to maintain the same level of performance by investing additional effort, even under extreme conditions involving sleep deprivation or long hours of exhausting work. He asserts, however, that this depends mainly on the individuals' willingness to do so and at what costs, rather than on their ability to deliver a certain effort (Meijman & Mulder, 1998). The individual may choose to comply with the assignment in a way that may match his/her appreciation of his actual state, by not making an optimal effort or by adopting a less strenuous strategy. Alternatively, he or she may decide to adjust his actual state in the direction of the required state by investing compensatory effort (Hockey, 1986). It seems quite natural that individuals working in a hospital environment would adopt the strain mode of demand management, rather than adopting an indirect coping mode and thus becoming disengaged from the task. The strain mode is characterised as a striving to overcome environmental demands in order to maintain task goals and is likely to result in negative spillover from work to home (Hockey, 2000).

In conclusion, further research is needed with the inclusion of physiological measures in order to confirm the above observations. The implications of the replication of such findings in a nursing population will be considered in chapter 9.

7.7.2 Comparison of aggregated and standardized pooled diary analysis

The analyses presented have also contrasted 2 methodological approaches to the analysis of diary data.

The results suggested the presence of aggregation biases. The lack of interactive effects when the averages over the diary completion period were used may indicate that focusing on such averages can obscure important relationships that take place over a much shorter time period. The results indicated that when between-person variance was removed by standardization, more substantial support for the model was found, indicating that within-individual variation plays a significant role in the support or not of the demand – control model. However, when within-person variance was eliminated, in the case of the aggregated analysis, the R^2 statistic for the regression equation was higher but the result was a failure to detect interactive effects. At the same time, however, because the equation does not show that demands, resources, effort in a given day affect strain, health complaints and effectiveness on that given day, the causal processes are quite ambiguous. Although these aggregated measures indicated relatively large main effects but no interactive effects, they could in fact reflect quite different underlying processes. Our analyses indicate that aggregation of the diary data over the diary completion period lead to very different conclusions regarding the relationship between demands, resources, effort and the outcome measures.

The temporal aggregation of several consecutive observations is a useful way to decrease measurement error. Indeed, it has been proposed that such an aggregation strategy may help to demonstrate moderately high levels of behavioural stability

(Epstein, 1979, 1980). However, the results of the present analysis highlight the potential loss of information and analytic power that can occur when daily observations are aggregated over time. The benefits of temporal averaging in order to obtain more stable measures (by reducing within-person variance) may therefore be obtained at the price of obscuring the true causal process at the daily level (Gortmaker, Eckenrode & Gore, 1982). The present analysis presents an example of the extent to which an aggregation of data over time can lead to biased inferences concerning behaviour that takes place during shorter time intervals.

In particular, if the research question concerns the causal relationship between variables measured daily rather than the demonstration of the stability of a given behavioral or psychological characteristic, aggregating daily observations may obscure short-term relationships. It is therefore recommended that both aggregated and disaggregated approaches are used with such time-series data, so that the relative advantages of each approach can be compared within a given study.

7.7.3 Methodological considerations

A point should be made regarding the small size of the correlations and the small amount of explained variance found in the present study. Before one concludes that the size of the correlations found is too low for practical matters, several points must be considered. Authors such as Semmer, Zapf & Grief (1996) have speculated on the size of correlations or causal effects that might be expected in occupational stress research. They asserted that the work situation is only one of the many areas of life that have an influence on ill health. Additionally, biological factors and early life experiences also contribute to dysfunctioning. Due to the multiple causes of psychological and physical health, it is not realistic to expect correlations higher than .20 - .25 for a single stressor. Methodological reasons speak for low correlations as well

(Frese, 1985). Any research that samples from a working population tends to underestimate the "true" relationship between stress at work and ill health because of restriction of variance of the dependent variable. People who have become ill due to stress at work will be absent more often, will be unemployed more frequently, or will retire sooner and thus be underrepresented in the sample. Thus there is the healthy worker effect (Frese & Okonek, 1984).

Moreover, looking at the variance explained by the interaction, although highly statistically significant, it is not large. Consequently, it may be tempting to dismiss the finding as theoretically interesting but of little practical importance. There are two reasons why this would be in error. First, as O'Grady (1982) makes explicit, any given study is necessarily limited in the amount of variance it can explain because it can only cover some of the relevant variables. In the present case, several work characteristics were included, but there are several others of potential relevance that were not part of the study. More comprehensive coverage probably would reveal larger effects. Second, the amount of variance explained is attenuated by measurement error. This is the case for the main effects but is generally exacerbated when variable are multiplied together to form cross-product terms as required to test for interactions within regression analysis (Aiken & West, 1991; Busmeyer & Jones, 1983).

Finally, our results indicate the possibility of nonlinearity. This issue will be briefly considered below. Generally, the possibility of curvilinear relationships is overlooked by researchers who focus only on linear effects (de Jonge *et al.*, 2000; Teuchman *et al.*, 1999). Warr (1990,1994) questioned the assumption of linear relationships in the demand – control model by postulating curvilinear relationships between job characteristics and employee health, with optimal levels at the middle of the range. Several studies have demonstrated curvilinear relationships (Fletcher & Jones, 1993; Warr, 1990). In addition, Lubinski & Humphreys (1990) assert that the

presence or absence of curvilinear effects may also be a good statistical reason whether or not spurious interactive effects were found in demand – control studies and this may account for the findings of the present study as well. The issue of nonlinearity is significant and will be considered further in chapter 9.

7.7.4 Conclusion

The results of the present chapter suggest that there is a merit in employing diary methodologies in order to resolve problems associated with conventional cross-sectional designs and most importantly due to their rich analytic potential. By using two different data collection techniques and employing three different analytic approaches, we were able to compare and contrast them and gain a unique perspective on their reliability.

In conclusion, in the present chapter we took full advantage of a prospective daily design to examine the demand – control model cross-sectionally. To our knowledge, the demand – control model has never been assessed using a diary methodology and the combination of two analytic procedures, aggregated analysis and standardized pooled analysis. These benefits include minimizing retrospection errors and biases in the assessment of stressors and strain; mitigating effects of person and situation variables that could confound stress-outcome relations; and establishing temporal sequences by the inclusion of a lagged dependent variable. These design issues and analytic strategies maximized the powerfulness of analysis and enabled the assessment of the demand – control model in a rigorous manner. The results highlight the importance of focusing in microanalytic processes when testing the demand – control model.

We concluded that different data collection techniques and analytic procedures could result in a differential reliability and validity. The value of the disaggregated approach was demonstrated.

CHAPTER 8

ANALYSIS OF THE LONGITUDINAL DATA

8.1 Introduction

The present study aimed at providing a thorough examination of the demand – control model, both cross-sectionally and longitudinally, with the use of questionnaires and diaries. The diary data offered the potential of aggregation, thus yielding more reliable, generalisable and valid data. Details on the merits of aggregation have been considered in sections 3.1 and 6.1 and therefore will not be repeated here.

In the present chapter the demand – control model was examined longitudinally. In addition, longitudinal effects of effort on the outcome variables were examined, since effort has been implicated as an intervening variable in the regulation of demands. The longitudinal framework allowed us to examine causality of the relationships, to take into account several third variables such as age and marital status and to control for prior functioning. The controlling for the above variables was achieved by their inclusion into the regression equation.

The diary data and the questionnaire data were analysed longitudinally. The diary data are more reliable as they are not based on retrospective recall and therefore do not suffer from recall biases. Additionally, they offer the possibility of using aggregation and standardised pooling, thus enhancing their reliability further. On the other hand, the questionnaire data are reported retrospectively, but they contain reliable and valid scales and therefore provide a reliable instrument.

8.2 Participants and measures

The analyses were conducted on the 137 individuals that completed both diaries and the questionnaires on both waves. For the diary data, *emotional demands, mental*

demands, problem-solving demands and *physical demands* were combined to produce a single measure of *job demands* and *timing control, method control* and *social support* were combined in a single measure representing the *resources* available to the individual. For the questionnaire data, *cognitive demands, responsibility demands, emotional demands* and *physical demands* were combined to produce one measure of *job demands*. Similarly, *timing control, method control* and *social support* were combined to represent a measure of *resources*.

8.3 Statistical procedures

Both the diary data and the questionnaire data were analysed longitudinally with correlational and hierarchical multiple regression analyses.

8.3.1 Correlation analysis

Correlations were computed separately for each data set on both waves. The tables show the means, standard deviations and the intercorrelations among the study variables.

8.3.2 Regression analysis

The second step in the analysis was the use of moderated regression analysis. It has been argued that interactions ideally should be tested with moderated regression analysis (Aiken & West, 1991; Landsbergis *et al.* 1994). This procedure has been recommended as the most appropriate method for testing main effects and interactions when independent measures are continuous (Bromet *et al.*, 1988; Cohen & Cohen, 1983; Parkes, 1991).

The independent variables were standardised as a precaution against problems of multicollinearity associated with moderated multiple regression (Finney *et al.*, 1984;

Jaccard, Turrisi & Wan, 1990). Additionally, the interaction term was built from the standard scores, thus having a much lower correlations with the independent variables than the interaction term built from the non-standard scores (Carayon, 1993).

In the hierarchical moderated regression approach (Cohen & Cohen, 1983; Zedeck, 1971) the initial values of the dependent variable (T1 values) entered first. This partialled out the influence of earlier dysfunctioning and thus investigated the effects of stressors (demands, effort) and resources on the change of the dependent variable. Because the regression weights of the interaction terms are not invariant to transformations, only the significance of the increase of R^2 can be interpreted (J. Cohen, 1978). One problem of the moderated regression analysis approach is the lack of power (Aiken & West, 1991; Stone-Romero & Anderson, 1994). Therefore, the liberal significance criterion of .10 was used, as was done in other studies (House & Wells, 1978; LaRocco, House & French, 1980; Winnubst, Marcelissen & Kleber, 1982) and was recommended by Pedhasur (1982).

The regression procedure was carried out in nine steps. The first step involved controlling for background variables. By entering background variables as covariates in the first step of the hierarchical regression analyses, systematic variance attributable to peripheral factors is removed. The main effects were entered in an additive manner and the interaction terms were entered last. Thus, in the first step of the analysis, the background variables of *age* and *marital status* (n -1 dummy coded) were entered, in order to control for their effects. The corresponding outcome variable of wave 1 was entered in the second step, in order to control for its effects as well. Following the procedures recommended by Zapf *et al.* (1996) when using hierarchical regression in a longitudinal study, after controlling for prior dysfunctioning, stressors in wave 1 and in wave 2 are entered, in order to test for lagged and synchronous effects. Therefore, in the third step *demands* of the first wave were entered in order to test for lagged effects and

in the fourth step *demands* of the second wave were entered, in order to test for synchronous effects. The fifth and sixth step, following standard analytical procedure consisted of entering the *resources* (control, support) variable in wave 1(main effect) and the relevant cross-product term (*demands* x *resources*: interaction effect in wave 1). In the seventh step *effort* in wave 1 was included in order to test for lagged effects of *effort* and in the eighth step *effort* in wave 2 was entered, in order to test for synchronous effects. Finally in the ninth step, the interactions of *effort* with *demands*, of *effort* with *resources* and the three-way interaction of *demands, resources* and *effort* in wave 1 were entered.

8.4 (a) Diaries: Longitudinal aggregated analysis

As previously noted, the means across the 24 diary completion days were averaged, in order to obtain a reliable mean for each individual.

8.4.1(a) Correlation analysis

Table 8.1 presents the longitudinal intercorrelations among the main study variables. Demands in the first wave correlated with strain ($r = .28, p < .01$) and health complaints ($r = .28, p < .01$) but not with effectiveness. Surprisingly, demands did not correlate with effort or with resources. Longitudinally, demands showed a low correlation only with strain ($r = .19, p < .05$). All the correlations, however, were in the expected theoretical direction. Resources correlated with all three outcome variables in wave 1, as expected. Looking at the longitudinal correlations, resources demonstrated lower correlations this time but again with all outcome variables of wave 2 and in a theoretically meaningful direction. Quite surprisingly, effort correlated only with effectiveness in wave 1. Finally, all the outcome variables in both waves displayed moderate to strong intercorrelations and all of them were in the expected theoretical direction.

Table 8.1: Descriptive statistics and correlation matrix of the longitudinal study variables *(n = 137)*

Variables	*Mean*	*SD*	*DEM1*	*RES1*	*EFR1*	*STR1*	*HC1*	*EFC1*	*STR2*	*HC2*
Demands (DEM1)	4.57	1.04								
Resources (RES1)	6.33	1.07	.07							
Effort (EFR1)	2.67	.22	.14	-.09						
Strain (STR1)	3.98	.87	.28**	-.42**	.12					
Health complaints (HC1)	.37	.24	.28**	-.27**	.07	.55**				
Effectiveness (EFC1)	7.07	.90	.06	.50**	.27**	-.37**	-.26**			
Strain (STR2)	3.77	.83	.19*	-.21*	.07	.55**	.39**	-.23**		
Health complaints (HC2)	.31	.21	.06	-.23**	.08	.39**	.63**	-.23**	.41**	
Effectiveness (EFC2)	7.03	.76	-.00	.22*	.15	-.21**	-.26**	.61**	-.25**	-.33**

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

8.4.2 (a) Regression analysis

Table 8.2: Summary of the moderated regression analysis – ***Strain (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.058	.058	-.258*	< .05
	Married			.012	ns
	Single			-.022	ns
2.	**Strain (Wave 1)**	.309	.251	.521***	< .001
3.	**Demands (Wave 1)**	.311	.002	.049	ns
4.	**Demands (Wave 2)**	.330	.019	.209†	= .055
5.	**Resources (Wave 1)**	.330	.000	.000	ns
6.	**Demands x Resources (Wave 1)**	.331	.001	-.034	ns
7.	**Effort (Wave 1)**	.331	.000	.000	ns
8.	**Effort (Wave 2)**	.342	.011	.121	ns
9.	**Demands x Effort (Wave 1)**	.366	.023	-.068	ns
	Effort x Resources (Wave 1)			.047	ns
	Demands x Resources x Effort (Wave 1)			.167*	< .05

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ * $p < .05$ *** $p < .001$

As can be seen from the table, the background variables of age and marital status accounted for a significant increase in the variance in strain in wave 2 ($\Delta R^2 = .058$, $F = 2.745$, $p < .05$), indicating that age and marital status are predictors of strain. The effects of these variables, however, have been controlled for. Similarly, strain in wave 1 accounted for a significant 25 % of the variance in strain in wave 2 ($\beta = .521$, $F = 47.861$, $p < .001$). It is clear that strain in wave 1 is a major predictor of strain in wave 2. The sign of the regression coefficient indicates that strain in wave 1 is associated with an increase in strain in wave 2. However, as already noted, the effects of strain in wave 1 have been controlled for. Demands in wave 1 did not account for any significant variance in strain in wave 2, indicating no longitudinal effect of demands on strain. On the other hand, a marginally significant effect of demands in wave 2 had on strain in wave 2 was observed, indicating a synchronous effect ($\beta = .209$, $p = .055$). Specifically,

according to the above result, demands increased strain, thus indicating negative effects of job demands.

No significant longitudinal effects of resources and the interaction of demands and resources on strain were found. Additionally, effort and the interaction of effort with demands and effort with resources in wave 1 did not account for any significant variance in strain in wave 2. A significant interactive effect of demands, resources and effort on strain in wave 2 was observed ($\beta = .167, p < .05$). This interaction was unexpected and incongruent with theory as it implies that high resources and effort increase the effects of demands on strain, thus demonstrating an enhancing effect of resources and effort. This finding will be considered in detail later on.

Table 8.3: Summary of the moderated regression analysis – ***Health complaints (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.001	.001	-.004	ns
	Married			-.023	ns
	Single			-.048	ns
2.	**Health complaints (Wave 1)**	.401	.400	.638***	< .001
3.	**Demands (Wave 1)**	.416	.016	-.136†	= .06
4.	**Demands (Wave 2)**	.430	.014	.176†	= .08
5.	**Resources (Wave 1)**	.431	.001	-.039	ns
6.	**Demands x Resources (Wave 1)**	.432	.000	.006	ns
7.	**Effort (Wave 1)**	.433	.001	.036	ns
8.	**Effort (Wave 2)**	.434	.001	-.034	ns
9.	**Demands x Effort (Wave 1)**	.454	.021	.122 †	= .09
	Effort x Resources (Wave 1)			-.080	ns
	Demands x effort x resources (Wave 1)			-.073	ns

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ *** $p < .001$

Looking at Table 8.3, the background variables of age and marital status did not have any significant effect on health complaints in wave 2. Health complaints in wave

1, however, accounted for a significant 40 % of the variance in health complaints in wave 2 ($\beta = .638$, $F = 88.076$, $p < .001$) indicating, as expected, that health complaints in wave 1 were major predictors of health complaints in wave 2. The standardised Beta coefficient indicates that health complaints in wave 1 increase health complaints in wave 2. However, the effects of this variable have been controlled.

In addition, demands in wave 1 accounted for a marginally significant increase in the variance in health complaints in wave 2 ($\Delta R^2 = .016$, $F = 3.560$, $p = .06$). Looking at the regression coefficient ($\beta = -.136$, $p = .06$), demands in wave 1 were shown to reduce health complaints in wave 2. This finding is quite surprising as it suggests longitudinally beneficial effects of job demands and will be considered further later on. Additionally, demands in wave 2 accounted for a marginally significant increase in the variance in health complaints in wave 2 ($\Delta R^2 = .014$, $F = 3.123$, $p = .08$). The standardised Beta coefficient demonstrates a synchronous detrimental effect of demands ($\beta = .176$, $p = .08$), as they result in an increase in health complaints. This result is consistent with a wide literature indicating negative effects of demands.

Finally, a marginally significant interactive effect of demands and effort on health complaints in wave 2 was observed ($\beta = .122$, $p = .09$). This result indicates that effort enhances the effects of demands on health complaints, thus suggesting a negative effect of effort and will be considered later on.

Table 8.4: Summary of the moderated regression analysis – ***Effectiveness (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.011	.011	-.067	ns
	Married			-.217	ns
	Single			-.221	ns
2.	**Effectiveness (Wave 1)**	.406	.395	.653***	< .001
3.	**Demands (Wave 1)**	.407	.001	-.033	ns
4.	**Demands (Wave 2)**	.408	.000	-.031	ns
5.	**Resources (Wave 1)**	.416	.008	-.107	ns
6.	**Demands x Resources (Wave 1)**	.420	.004	-.069	ns
7.	**Effort (Wave 1)**	.422	.002	-.048	ns
8.	**Effort (Wave 2)**	.437	.015	.144†	= .07
9.	**Demands x Effort (Wave 1)**	.440	.002	.006	ns
	Effort x Resources (Wave 1)			.027	ns
	Demands x Resources x Effort (Wave 1)			.047	ns

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ *** $p < .001$

Looking at table 8.4, the controlled background factors of age and marital status did not have any significant effect on effectiveness in wave 2. As was expected, effectiveness in wave 1 accounted for a significant 39.5 % of the variance in effectiveness in wave 2 ($\beta = .653$, $F = 87.919$, $p < .001$), indicating that effectiveness in wave 2 can be predicted from effectiveness in wave 1. The regression coefficient indicates that effectiveness in wave 1 increases effectiveness in wave 2. The effects of this variable have been already controlled for.

Demands in wave 1 and demands in wave 2 did not have any significant effect on effectiveness in wave 2, indicating no synchronous or lagged effects of demands on effectiveness. Similarly, resources and the interaction of demands and resources in wave 1 did not show any significant effects on effectiveness in wave 2. Finally, effort in wave 1 and the interactions of effort with demands, effort with resources and the three-way interaction of demands, resources and effort in wave 1 did not account for any variance

in effectiveness in wave 2. Possible reasons for this lack of longitudinal effects of these variables will be discussed later. The finding that effort in wave 2 accounted for a marginally significant increase in the variance in effectiveness in wave 2 ($\Delta R^2 = .015$, F = 3.455, $p = .07$) is worth noting. Looking at the standardised Beta coefficient ($\beta = .144$, $p = .07$), effort is associated with an increase in effectiveness. This effect, however, is synchronous and not longitudinal.

8.4.3 (a) Summary of findings of the longitudinal aggregated analysis

Looking at the results of the longitudinal aggregated analysis, there is an overall lack of longitudinal interactive effects of demands and resources on any of the outcome variables. A statistically significant interactive effect of demands, resources and effort on strain is worth noting. However, the interaction was in a direction opposite from the one hypothesised, indicating enhancing, rather than suppressing, effects of resources and effort. A marginally significant interactive effect of demands and effort on health complaints should also be noted, again indicating enhancing effects of effort.

Additionally, the results failed to demonstrate any statistically significant longitudinal main effects. Several marginally significant main effects were only found, but only one of them was longitudinal. Specifically, a longitudinal main effect of demands on health complaints was observed, suggesting beneficial longitudinal effects of job demands. Moreover, synchronous effects of demands on strain and health complaints were also demonstrated, implying detrimental effects of demands and thus being consistent with theory. Finally, a synchronous effect of effort on effectiveness should be mentioned, indicating positive impact of effort on effectiveness.

8.4 (b) Diaries – Longitudinal aggregated analysis

8.4.1 (b) Regression analysis

In order to check for possible low compliance and disengagement of the nursing staff while completing the diary, regression analyses were carried out on the diary means of 8 completion days, instead of the total 24 completion days. The regression analysis was carried out following the same steps outlined above. The results of this second regression analysis will be briefly discussed below.

Table 8.5: Summary of the moderated regression analysis – ***Strain (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.046	.046	-.198†	= .053
	Married			-.048	ns
	Single			-.020	ns
2.	**Strain (Wave 1)**	.291	.245	.512***	< .001
3.	**Demands (Wave 1)**	.293	.002	.051	ns
4.	**Demands (Wave 2)**	.337	.043	.286**	< .01
5.	**Resources (Wave 1)**	.338	.001	.039	ns
6.	**Demands x Resources (Wave 1)**	.340	.002	.044	ns
7.	**Effort (Wave 1)**	.341	.001	.036	ns
8.	**Effort (Wave 2)**	.359	.018	.152†	= .06
9.	**Demands x Effort (Wave 1)**	.373	.014	.036	ns
	Effort x Resources (Wave 1)			-.042	ns
	Demands x Resources x Effort (Wave 1)			.120	ns

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ ** $p < .01$ *** $p < .001$

Looking at the table above, age and marital status accounted for a marginally significant increase in the variance in strain in wave 2 ($\Delta R^2 = .046$, $F = 2.149$, $p = .09$). Additionally, a marginally significant effect of age on strain in wave 2 was found ($\beta = -.198$, $p = .053$). This finding coincides with the one of the regression analysis on the means of the 24 completion days. The effects of this variable, however, have already

been controlled for. Strain in wave 1 accounted for a significant 24.5 % of the variance in strain in wave 2 ($\beta = .512$, $F = 45.599$, $p < .001$), indicating that strain in wave 2 can be predicted from strain in wave 1. The regression coefficient indicates that strain in wave 1 increases strain in wave 2. However, the effects of this variable have been controlled as well. Again this result is similar to the one from the regression analysis on the means of the 24 completion days.

Demands in wave 1 did not account for any significant variance in strain, indicating no lagged effects of demands on strain. Demands in wave 2, however, accounted for a significant 4.3 % of the variance in strain in wave 2 ($\beta = .286$, $F = 8.473$, $p < .01$), suggesting the presence of synchronous effects of demands on strain. Looking at the standardised Beta coefficient, it indicates detrimental effects of demands, a result that is congruent with theory. Resources and the interaction of demands and resources on wave 1 did not have any significant effect on strain in wave 2. Similarly, effort in wave 1 did not account for any significant variance in strain in wave 2. Effort in wave 2, on the other hand, accounted for a marginally significant increase in the variance in strain in wave 2 ($\Delta R^2 = .018$, $F = 3.519$, $p = .06$). The sign of the regression coefficient ($\beta = .152$, $p = .06$) suggests a synchronous negative effect of effort as it shows that effort increases strain.

Finally, the interactions of effort with demands, effort with resources and the three-way interaction of demands, resources and effort, did not account for any significant increase in the variance in strain in wave 2, indicating that the above variables are not major predictors of strain in wave 2. Overall, this second analysis using the means of 8 diary completion days revealed a similar pattern of results to the ones from the means across the 24 diary completion days.

Table 8.6: Summary of the moderated regression analysis – ***Health complaints (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.006	.006	.075	ns
	Married			-.109	ns
	Single			-.041	ns
2.	**Health complaints (Wave 1)**	.233	.228	.481***	< .001
3.	**Demands (Wave 1)**	.236	.002	-.053	ns
4.	**Demands (Wave 2)**	.240	.004	.087	ns
5.	**Resources (Wave 1)**	.241	.002	-.045	ns
6.	**Demands x Resources (Wave 1)**	.242	.000	.015	ns
7.	**Effort (Wave 1)**	.247	.005	.077	ns
8.	**Effort (Wave 2)**	.252	.005	.080	ns
9.	**Effort x Demands (Wave 1)**	.264	.012	-.096	ns
	Effort x Resources (Wave 1)			.073	ns
	Demands x Resources x Effort (Wave 1)			-.024	ns

Note: the Table shows standardised β weights for each step of the analysis.
*** $p < .001$

In the examination of the health complaints variable, the controlled background variables of age and marital status did not account for any significant variance in health complaints in wave 2. Health complaints in wave 1, on the other hand, accounted for a significant 22.8 % of the variance in health complaints in wave 2 ($\beta = .481$, $F = 39.232$, $p < .001$), indicating that health complaints in wave 1 are major predictors of health complaints in wave 2, as expected. The sign of the regression coefficient indicates that health complaints in wave 1 are associated with an increase in health complaints in wave 2. The effects of this variable have been controlled for.

Furthermore, demands in wave 1 and wave 2, resources, and their interaction did not account for any significant variance in health complaints in wave 2. Similarly, effort in wave 1 and in wave 2 did not have any significant effect on health complaints, indicating lack of synchronous and lagged effects of effort. Finally, the interactions of

effort with demands, effort with resources and the three-way interaction of demands, resources and effort did not have any significant effect on health complaints in wave 2.

In summary, in this second analysis of the outcome variable of health complaints, some of the effects shown in the first analysis were lost. However, it should be noted that these effects were reaching marginal significance in the first analysis.

Table 8.7: Summary of the moderated regression analysis – ***Effectiveness (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.029	.029	-.143	ns
	Married			-.296	ns
	Single			-.359	ns
2.	**Effectiveness (Wave 1)**	.349	.321	.585***	< .001
3.	**Demands (Wave 1)**	.355	.006	-.081	ns
4.	**Demands (Wave 2)**	.359	.003	.081	ns
5.	**Resources (Wave 1)**	.373	.014	-.143†	= .09
6.	**Demands x Resources (Wave 1)**	.379	.005	-.075	ns
7.	**Effort (Wave 1)**	.380	.002	-.042	ns
8.	**Effort (Wave 2)**	.400	.020	.161*	< .05
9.	**Demands x Effort (Wave 1)**	.413	.012	-.081	ns
	Effort x Resources (Wave 1)			-.051	ns
	Demands x Resources x Effort (Wave 1)			-.075	ns

Note: the Table shows standardised β weights for each step of the analysis
† $p < .10$ * $p < .05$ *** $p < .001$

Looking at table 8.7, the controlled background variables of age and marital status did not account for any significant variance in effectiveness in wave 2. Effectiveness in wave 1, however, accounted for a significant 32.1 % of the variance in effectiveness in wave 2 ($\beta = .585$, $F = 65.045$, $p < .001$). According to the above, effectiveness in wave 1 is a major predictor of effectiveness in wave 2. The standardised Beta coefficient demonstrates that effectiveness in wave 1 is associated with an increase in effectiveness in wave 2. Demands in wave 1 and in wave 2 did not account for any

significant variance in effectiveness in wave 2, indicating lack of both lagged and synchronous effects of demands on effectiveness. Resources, on the other hand, accounted for a marginally significant variance in effectiveness ($\Delta R^2 = .014$, $F = 2.970$, $p = .09$). Rather unexpectedly, the sign of the regression coefficient ($\beta = -.143$, $p = .09$) indicates that resources reduce effectiveness. The above finding is inconsistent with theory, as it suggests a longitudinal negative effect of resources. The interaction of demands and resources and effort in wave 1 did not account for any significant variance in effectiveness.

On the other hand, effort in wave 2 accounted for a small but significant 2 % of the variance in effectiveness ($\Delta R^2 = .020$, $F = 4.235$, $p < .05$). Looking at the standardised Beta coefficient ($\beta = .161$, $p < .05$), it indicates synchronous beneficial effects of effort as it is associated with an increase in effectiveness. Finally, the interactions of effort with demands, effort with resources and the three-way interaction of demands, resources and effort, did not account for any significant variance in effectiveness in wave 2, suggesting that none of the above variables are predictors of effectiveness in wave 2.

In conclusion, the results of the regression analysis on the means of the 24 completion days were similar to the ones of the regression analysis on the means of the 8 completion days, for the effectiveness variable as well. An additional marginally significant effect of resources on effectiveness was found in this analysis.

8.4.2 (b) Summary of findings of longitudinal aggregated analysis

The findings of the second longitudinal aggregated analysis based on the means of the 8 diary completion days also failed to provide any support for the interactive hypothesis of the demand – control model longitudinally. Moreover, no longitudinal interactive effects of effort on any of the outcome variables were found.

Overall, a synchronous effect of demands on strain was observed, indicating negative effects of demands. Effort in wave 2 demonstrated a statistically significant effect on effectiveness, suggesting that effort increases effectiveness. A marginally significant synchronous effect of effort on strain should also be noted, postulating a negative impact of effort. Finally, a marginally significant longitudinal effect of resources on effectiveness is noteworthy. However, this result demonstrated detrimental effects of resources, as they were shown to reduce effectiveness.

8.5 Overview of the longitudinal aggregated analysis

Overall, the results of the two longitudinal aggregated analyses, the one based on the means across the 24 diary completion days and the second based on the means across the first 8 diary completion days, failed to provide any support for the demand – control model. An unexpected finding of the first analysis was the indication of beneficial effects of demands as they were shown to reduce health complaints. However, this finding was not replicated in the second analysis. In addition, the enhancing effects of effort that were indicated in the first analysis for the outcome variable of strain were not repeated in the second analysis. Beneficial effects of effort on effectiveness were found in both of the analyses and these will be considered later on.

8.6 Questionnaires – Longitudinal analysis

8.6.1 Correlation analysis

Table 8.8: Descriptive statistics and correlation matrix of the longitudinal study variables – Questionnaires *(n = 137)*

Variables	*Mean*	*SD*	*DEM1*	*RES1*	*EFR1*	*STR1*	*HC1*	*JSAT1*	*GHQ1*	*STR2*	*HC2*	*JSAT2*
Demands (DEM1)	3.98	.53										
Resources (RES1)	3.31	.61	.30**									
Effort (EFR1)	2.75	.55	.11	.07								
Strain (STR1)	4.35	1.21	.09	-.29**	-.23**							
Health complaints (HC1)	.59	.33	-.00	-.22**	-.12	.57**						
Job satisfaction (JSAT1)	4.52	.89	.02	.38**	.24**	-.51**	-.29**					
GHQ (GHQ1)	2.08	.55	-.01	-.15	-.30**	.55**	.41**	-.31**				
Strain (STR2)	4.20	1.17	.10	-.24**	-.26**	.67**	.29**	-.38**	.45**			
Health complaints (HC2)	.55	.29	.09	-.10	.01	.18*	.32**	-.07	.24**	.37**		
Job satisfaction (JSAT2)	4.45	1.03	-.06	.19*	.12	-.33**	-.13	.56**	-.18*	-.53**	-.35**	
GHQ (GHQ2)	2.02	.57	.10	-.07	-.07	.40**	.26**	-.18*	.49**	.51**	.31**	-.18*

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

Looking at the correlation matrix, the results indicated, surprisingly, a lack of any statistically significant correlations between demands with effort and demands with any of the outcome variables. Resources, on the other hand, correlated with three of the outcome variables, strain ($r = .30$, $p < .01$), health complaints ($r = -.22$, $p < .01$) and job satisfaction ($r = .38$, $p < .01$), in the expected theoretical direction. In addition, a longitudinal correlation of resources with strain in wave 2 ($r = -.24$, $p < .01$) and with job satisfaction in wave 2 ($r = .19$, $p < .05$) was observed, in a direction consistent with theory. Effort indicated largely beneficial effects as it correlated negatively with strain ($r = -.23$, $p < .01$) and GHQ ($r = -.30$, $p < .01$) and positively with job satisfaction ($r = .24$, $p < .01$). Moreover, effort correlated longitudinally with strain in wave 2 ($r = -.26$, $p < .01$). Finally, most of the outcome variables indicated small to moderate intercorrelations.

8.6.2 Regression analysis

Table 8.9: Summary of the moderated regression analysis – ***Strain (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.009	.009	-.094	ns
	Married			-.001	ns
	Single			-.107	ns
2.	**Strain (Wave 1)**	.444	.435	.667***	< .001
3.	**Demands (Wave 1)**	.446	.002	.045	ns
4.	**Demands (Wave 2)**	.451	.005	.097	ns
5.	**Resources (Wave 1)**	.455	.004	-.069	ns
6.	**Demands x Resources (Wave 1)**	.465	.011	-.108	ns
7.	**Effort (Wave 1)**	.476	.011	-.109	ns
8.	**Effort (Wave 2)**	.482	.006	-.098	ns
9.	**Demands x Effort (Wave 1)**	.515	.032	-.103	ns
	Effort x Resources (Wave 1)			.082	ns
	Demands x Resources x Effort (Wave 1)			.132†	= .09

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ *** $p < .001$

Looking at table 8.9, the background variables of age and marital status did not have any significant effect on strain in wave 2. Strain in wave 1, on the other hand, accounted for a significant 43.5 % of the variance in strain in wave 2 ($\beta = .667$, $F = 103.172$, $p < .001$). This clearly indicates that strain in wave 1 is a major predictor of strain in wave 2. The sign of the standardised Beta coefficient indicates that strain in wave 1 is associated with an increase in strain in wave 2. The effects of this variable, however, have been controlled for. A finding that is worth noting is that the interactions of demands with effort, resources with effort and the three-way interaction of demands, resources and effort accounted for a significant increase in the variance in strain ($\Delta R^2 = .032$, $F = 2.746$, $p < .05$). The regression coefficient of the 3-way interaction indicates a marginally significant interactive effect of demands, resources and effort had effect on strain in wave 2 ($\beta = .132$, $p = .09$). This result is quite surprising as it implies that high resources and high effort in wave 1 enhance the effects of demands on strain in wave 2, therefore indicating detrimental effects of both resources and effort.

Table 8.10: Summary of the moderated regression analysis – ***Health complaints (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.006	.006	.042	ns
	Married			-.172	ns
	Single			-.170	ns
2.	**Health complaints (Wave 1)**	.114	.108	.333***	< .001
3.	**Demands (Wave 1)**	.122	.008	.090	ns
4.	**Demands (Wave 2)**	.147	.025	.208†	= .054
5.	**Resources (Wave 1)**	.153	.006	-.083	ns
6.	**Demands x Resources (Wave 1)**	.157	.004	-.069	ns
7.	**Effort (Wave 1)**	.163	.006	.078	ns
8.	**Effort (Wave 2)**	.163	.000	-.016	ns
9.	**Demands x Effort (Wave 1)**	.198	.035	.027	ns
	Effort x Resources (Wave 1)			.128	ns
	Demands x Resources x Effort (Wave 1)			.125	ns

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ *** $p < .001$

Examining the health complaints variable in wave 2, age and marital status did not account for any significant variance in health complaints in wave 2. Health complaints in wave 1, however, accounted for a significant 10.8 % of the variance in health complaints in wave 2 ($\beta = .333$, $F = 16.136$, $p < .001$). This suggests that health complaints in wave 1 are a major predictor of health complaints in wave 2, as expected. Looking at the regression coefficient, it indicates that health complaints in wave 1 are associated with an increase in health complaints in wave 2. However, the effects of this variable have been controlled. Demands in wave 1 did not have any significant effect on health complaints in wave 2, suggesting no longitudinal effects of job demands on health complaints. Demands in wave 2, on the other hand, accounted for a marginally significant 2.5 % of the variance in health complaints in wave 2 ($\beta = .208$, $F = 3.794$, $p = .054$). The sign of the standardised Beta coefficient indicates that job demands increase health complaints. This finding is consistent with theoretical expectations as it implies synchronous detrimental effects of job demands.

Table 8.11: Summary of the moderated regression analysis – ***Job satisfaction (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*P*
1.	**Age**	.015	.015	.092	ns
	Married			-.131	ns
	Single			.013	ns
2.	**Job satisfaction (Wave 1)**	.317	.302	.559***	< .001
3.	**Demands (Wave 1)**	.321	.004	-.067	ns
4.	**Demands (Wave 2)**	.329	.008	-.117	ns
5.	**Resources (Wave 1)**	.329	.000	-.013	ns
6.	**Demands x Resources (Wave 1)**	.335	.006	.084	ns
7.	**Effort (Wave 1)**	.336	.001	-.028	ns
8.	**Effort (Wave 2)**	.340	.004	.079	ns
9.	**Demands x Effort (Wave 1)**	.381	.041	-.158†	= .08
	Effort x Resources (Wave 1)			.070	ns
	Demands x Resources x Effort (Wave 1)			-.228**	< .01

Note: the Table shows standardised β weights for each step of the analysis.
† $p < .10$ ** $p < .01$ *** $p < .001$

Looking at table 8.11, the controlled background variables of age and marital status did not have any significant effect on job satisfaction in wave 2. Job satisfaction in wave 1, on the other hand, accounted for a significant 30.2 % of the variance in job satisfaction in wave 2 ($\beta = .559$, $F = 58.279$, $p < .001$), indicating, as expected, that job satisfaction in wave 1 is a major predictor of job satisfaction in wave 2. Looking at the regression coefficient, it indicates that job satisfaction in wave 1 is associated with an increase in job satisfaction in wave 2. However, as already mentioned before, the effects of this variable have been controlled. No significant effects of demands in wave 1 and demands in wave 2 on job satisfaction were observed, indicating lack of both synchronous and longitudinal effects of demands on job satisfaction. Furthermore, resources, the interaction of demands with resources and effort in wave 1 and wave 2 did not account for any significant variance in job satisfaction in wave 2, indicating that none of the above variables could predict job satisfaction in wave 2.

The interactions of demands with effort, resources with effort and the three-way interaction of demands, resources and effort, on the other hand, accounted for a significant increase in the variance in job satisfaction ($\Delta R^2 = .041$, $F = 2.731$, $p < .05$). In addition, a marginally significant interactive effect of demands and effort on job satisfaction in wave 2 was observed ($\beta = -.158$, $p = .08$). This result is consistent with theory as is indicates a suppressing effect of effort. Specifically, according to the above finding, high effort reduces the effects of demands on job satisfaction longitudinally and this will be discussed in detail later on.

Moreover, a significant interactive effect of demands, resources and effort on job satisfaction in wave 2 was observed ($\beta = -.228$, $p < .01$). According to this result, under conditions of high resources and high effort the effects of demands on job satisfaction are reduced. This is an interesting finding as it indicates longitudinal buffering effects of resources and effort and it will be considered in detail.

Table 8.12: Summary of the moderated regression analysis – ***GHQ (Wave 2)***

Step	*Variables*	R^2	R^2 *change*	*Beta*	*p*
1.	**Age**	.001	.001	-.021	ns
	Married			-.072	ns
	Single			-.064	ns
2.	**GHQ (Wave 1)**	.248	.247	.510***	< .001
3.	**Demands (Wave 1)**	.259	.011	.107	ns
4.	**Demands (Wave 2)**	.261	.001	-.049	ns
5.	**Resources (Wave 1)**	.261	.000	-.017	ns
6.	**Demands x Resources (Wave 1)**	.261	.000	.010	ns
7.	**Effort (Wave 1)**	.265	.004	.067	ns
8.	**Effort (Wave 2)**	.273	.008	-.110	ns
9.	**Demands x Effort (Wave 1)**	.368	.095	-.297**	< .01
	Effort x Resources (Wave 1)			.243**	< .01
	Demands x Resources x Effort (Wave 1)			.043	ns

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

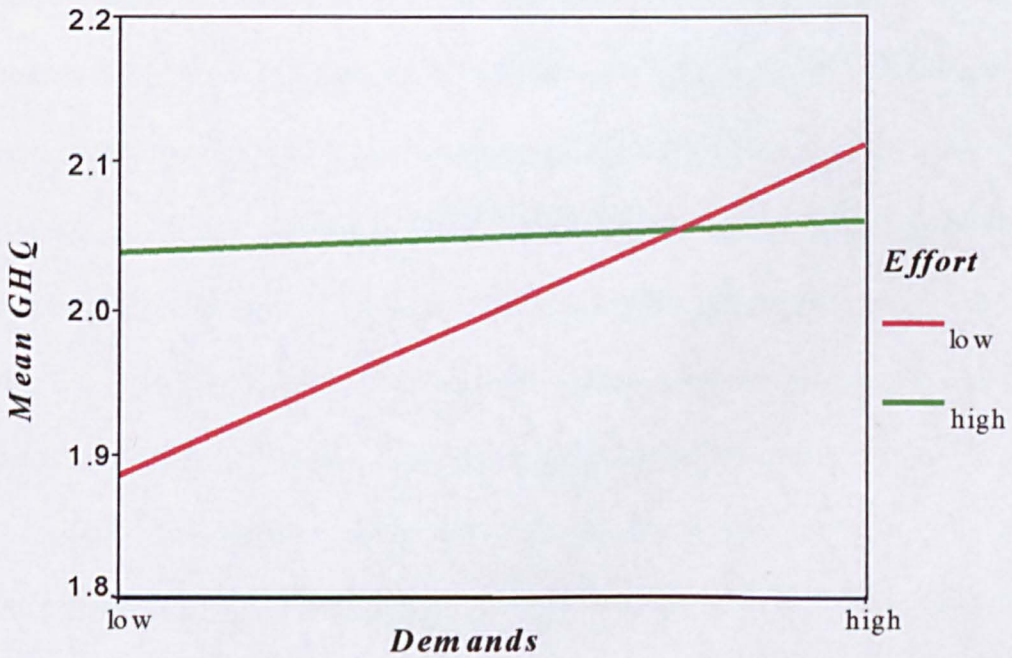

Figure 8.1: Interactive effects of demands and effort on GHQ – Wave 2

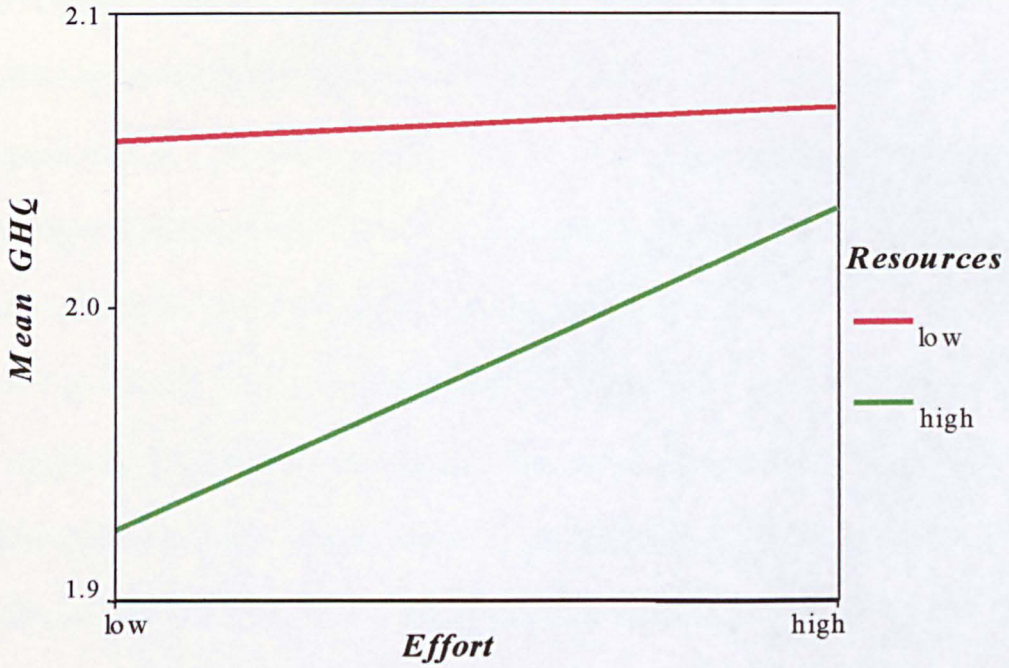

Figure 8.2: Interactive effects of effort and resources on GHQ - Wave 2

In the examination of the GHQ variable, age and marital status did not have any significant effect on GHQ in wave 2. GHQ in wave 1, on the other hand, accounted for a significant 24.7 % of the variance in GHQ in wave 2 ($\beta = .510$, $F = 43.338$, $p < .001$), demonstrating that GHQ in wave 2 can be predicted from GHQ in wave 1, as expected. The standardised Beta coefficient indicates that GHQ in wave 1 is associated with an in crease in GHQ in wave 2. However, the effects of this variable have already been controlled for. Demands in wave 1 and demands in wave 2 did not account for any significant variance in GHQ in wave 2. The above indicates lack of synchronous and lagged effects of job demands on mental distress. This will be considered later on. Furthermore, no significant longitudinal main effects of resources and interactive effects of demands with resources on GHQ scores were observed.

Similarly, effort in wave 1 and in wave 2 did not have any significant effect on GHQ scores in wave 2, indicating no synchronous or lagged effects of effort on GHQ. The interactions of effort with demands, effort with resources and the three-way

interaction of demands, resources and effort, however, accounted for a significant increase in the variance in GHQ scores ($\Delta R^2 = .095$, $F = 6.169$, $p < .01$). This finding indicates that the interactions of effort with demands, effort with resources and the interaction of demands, resources and effort in wave 1 are significant predictors of GHQ scores in wave 2. Moreover, significant interactive effects of effort and demands in wave 1 ($\beta = -.297$, $p < .01$) on GHQ in wave 2 were observed. Specifically, a longitudinal suppressing function of effort on the effects of demands on GHQ was found, a finding that is consistent with theoretical expectations and will be considered in detail. Finally, the interaction of effort with resources in wave 1 had a significant effect on GHQ scores in wave 2 ($\beta = .243$, $p < .01$). The above interactive effect is unexpected as it implies that high resources enhance the effects of effort on mental distress longitudinally. This result is quite surprising as it indicates enhancing effects of resources and it will be considered later on.

Figures 8.1 and 8.2 illustrate the interactive effects of demands with effort and effort with resources on GHQ. The direction of the interactions coincide with the one reported in the results. In particular, Figure 7.1 illustrates that high effort reduces the effects of demands on GHQ and Figure 7.2 indicates that high resources enhance the effects of effort on GHQ.

8.6.3 Summary of the findings of the longitudinal questionnaire analysis

The results of the longitudinal analysis based on the questionnaire data indicated overall lack of support for the demand – control interactive hypothesis. Additionally, no statistically significant longitudinal main effects on any of the outcome variables were observed. A marginally significant synchronous effect of demands on health complaints was found, suggesting detrimental effects of demands.

On the other hand, several statistically significant interactive effects of effort were observed. Specifically, a significant interactive effect of demands, resources and effort on job satisfaction was found, demonstrating longitudinal buffering effects of resources and effort and thus being congruent with theory. In addition, a statistically significant longitudinal buffering effect of effort on demands was found for the outcome variable of GHQ. Moreover, a significant longitudinal buffering effect of resources on effort was observed for the same outcome variable. A marginally significant longitudinal enhancing effect of resources and effort for the strain outcome variable should be noted. Finally, a marginally significant longitudinal suppressing effect of resources and effort was indicated for the job satisfaction variable.

8.7 Discussion

8.7.1 Overview

The present chapter aimed at examining the demand – control model longitudinally, in order to gain a better insight on the processes and the causal directions of the study variables. The model has been supported so far by an impressive body of cross-sectional research (Daniels & Guppy, 1994; De Rijk *et al.*, 1999; Muntaner & O'Campo, 1994). However, covariation is not causation, and therefore, over the last decade several longitudinal studies that examined the demand – control model have emerged. Nevertheless, these longitudinal studies did not manage to support the model as convincingly as the previous cross-sectional ones. A review of the studies that examined the model longitudinally can be found in section 3.2.

An explanation for these findings may be that most longitudinal studies on the demand – control model are based on an assessment of the workers' perceptions of their work situation at a single point in time, thereby possibly resulting in less accurate and

reliable assessments of their job characteristics since their judgments may have been affected by external factors (de Jange, Taris, Kompier, Houtman & Bongers, 2002). The diary methodology employed in the present study managed to overcome this problem by obtaining repeated measurements of the job characteristics and therefore providing a more reliable and stable assessment of these measures. The aggregation of the diary measures across time reduced error of measurement and improved the reliability and generalisability of the results. As has been discussed earlier, a longitudinal design involving repeated assessments over time, offers the possibility of controlling for stable background variables such as sociodemographic factors that may be responsible for spurious relationships between the variables under consideration. Consequently, taking advantage of the longitudinal design, several third variables were controlled for in this analysis.

The central analytical construct in the use of active control of resources is that of effort. Therefore effort has a central role in the management of demands under stress (Hockey, 1986). Consequently, further to the examination of effort cross-sectionally in the previous chapter, the main and interactive effects of effort on the different outcome variables were assessed longitudinally in the present chapter.

In summary, the aim of the present chapter was to examine the demand – control model longitudinally, using both the aggregated diary data and the questionnaire data and therefore offering the possibility of comparing the results of these two instruments. As noted before, the diaries provide more reliable data as the assessments of the job characteristics are made very close to the time of their occurrence and therefore overcome the problems associated with retrospective recall. On the other hand, the questionnaires are based on retrospective recall but include a number of well-validated scales and therefore are a reliable instrument for the assessment of the demand – control model and of effort.

8.7.2 Possible reasons for the lack of longitudinal effects

Before turning to the discussion of the longitudinal effects that were found, the reasons for the overall lack of longitudinal effects of the stressors on the outcome variables in the present study deserve consideration. We are hoping that the following discussion will provide interesting insights and will indicate several implications for future longitudinal research. However, a more detailed methodological discussion on future improvements on longitudinal research will be provided in chapter 9. Although the results of the present study may be consistent with other studies (Carayon, 1993) several explanations should be put forward in order to account for the failure to detect longitudinal effects.

The time component is of primal importance in longitudinal research and should be thoroughly considered in light of the results of the present study. The timeframe of all the variables under consideration should be taken into account when discussing these findings. Therefore, consideration of the duration of stress, the duration of stressors and the duration of the outcome variables may prove to provide meaningful explanations for these results.

Another issue that should be considered is that in all the prospective tests in which demands and resources at time 1 were used as predictors, a certain level of stability in exposure to these factors over the one-year period was assumed. However, during this period several nurses changed wards, resulting in changes in the nature of their job in terms of the demands, control and support they were experiencing. Ganster, Fox & Dwyer (2001), being aware of the above possibility, attempted to develop a measure of the variability of exposure during the period between testing but were unable to do so. They therefore note that any underlying changes during that time were treated as sources of error variance and may have further weakened the statistical power of the tests.

Thus, another intriguing possibility relates to the findings of the longitudinal analysis of the data. The lack of any prospective association between the variables under consideration raises the issue of variation in exposure, as a reduction in stressor intensity may have accounted for these results. Karasek & Theorell (1990) have argued that the duration of exposure to an unfavorable work situation is related nonlinearly to health, such that long-term exposure has comparatively stronger detrimental effects than short-term exposure. Several studies (Furda, Castermans, Meijman, Schreurs & Le Blanc, 1992; Bourbonnais *et al.*, 1999) suggest that (cumulative) exposure to a combination of high demands and low control affects health longitudinally. Yet none of the studies systematically contrasted the effects of stability and change in across-time exposure to demands and control (de Lange *et al.*, 2002). An exception to these studies is that of Schnall *et al.* (1994) who used an interesting way of analyzing stability and change in exposure by creating four "exposure profiles". Consequently, they created two stable exposure profiles, representing workers who were in the "high-strain" condition in both waves of measurement and workers who were in the "no-high strain" condition on both occasions and two changing exposure profiles, representing workers who changed from the "high-strain" condition to the "no-high strain" condition and vice versa. In line with the strain hypothesis of the demand – control model, those who were in the high-strain condition on both occasions reported the highest rates of ambulatory blood pressure. Furthermore, negative and positive changes in exposure to demands and control across time partially predicted negative and positive changes, respectively, in ambulatory blood pressure. One important strength of the study of Schnall *et al.* (1994) was that it explicitly revealed the effects of cumulative exposure to high strain on worker health, in comparison with cumulative exposure to no high strain and two variations of noncumulative exposure to high strain.

The above further highlights the importance of changes or stability in exposure in relation to the effects in well-being and this should be taken into consideration in view of the results of the present study.

The time lag issue is of great importance in longitudinal research. Systematic investigations of time lags are rare (Schonfeld, 1992; Kahn & Schooler, 1982), consequently information about adequate time lags is limited (Dormann & Zapf, 2002). Heise (1975) pointed out the necessity of a theory of a causal lag in order to decide the duration and spacing of longitudinal observations. However, only a sound theory concerning the relevant processes under consideration can result in good decisions about the timing of the observations (Nesselroade & Baltes, 1979). Usually, the time lags in longitudinal studies are pragmatically selected. This was the case in the present study. The first wave of data collection began in May, directly after the Easter vacation, and the second wave began in mid February, resulting in a time lag of approximately 10 months later. However, due to low compliance of the nursing staff, the data collection period was extended to approximately 5 months in each time of assessment, thus minimizing the time lag in some cases and resulting in a long time lag in other cases. Perhaps the time between "cause" and "effect" was too short, therefore leading to the conclusion that no causal effects exist and in some cases was too long, leading to the underestimation of the true causal effect (Zapf *et al.*, 1996). When a time lag is decided, the time course associated with different kinds of stressors should be considered (Frese & Zapf, 1988). This issue will be considered below.

In conclusion, the issue of the adequacy of a time lag can be resolved with a multi-wave design, which may allow the systematic assessment of the most adequate time lag relating to the particular stressors and strain variables under consideration (Dormann & Zapf, 1999, 2002; Zapf *et al.*, 1996). This matter will be considered further in chapter 9.

As previously mentioned, the duration of stress may determine the in the detection or not of longitudinal effects. Kawakami *et al.,* (1992) suggest that the temporal course of the effects of job stress should be taken into consideration in research because some job stress may be chronic or enduring while other job stress may be acute or short-termed and chronic or enduring job stress is probably a more important risk factor for illness than acute or short-termed job stress. It is possible, therefore, that nurses were experiencing short-term stress which might not have led to subsequent negative effects on their health and well-being in the long-term and this may account for the lack of longitudinal effects. To explain possible psychological mechanisms attributable to the present results, further longitudinal study is needed to examine temporal relationships among job stressors, stress reactions and health outcomes, using both subjective and objective measures and considering intervening variables (Kawakami *et al.*, 1992).

On the other hand, Eysenck distinguished between chronic and acute stress and asserted that chronic stress serves to "inoculate" (immunize) or protect individuals against illness, while acute stress results in immunosuppression and increased susceptibility (Roger & Hudson, 1995). One might therefore speculate that if the nursing staff in the present study were experiencing stress that was enduring in time, they became immunized against it and therefore did not indicate any long term effects of the stressors on their psychological and physical health.

Although different effects of chronic and acute stress have been hypothesized by different researchers, the above points serve to highlight the importance of the duration of stress in determining its effects on the outcome variables under consideration.

Epidemiological studies testing the demand – control model use dependent variables that consist of hard medical outcomes such as coronary heart disease, hypertension or death. Since these outcomes are developed gradually over a lengthy

period of time, their linkage to work experiences that are characterized by considerable fluctuations over such long periods becomes difficult (Ganster, Fox & Dwyer, 2001). Lately, organizational researchers predominantly assessed short-term outcomes such as job outcomes and physical symptoms such as headaches and gastrointenstinal problems, in relation to the demand – control model (Kinicki, McKee & Wade, 1996).

However, even for these short-term outcomes, it is difficult to establish for low long they tend to continue after being evoked by job stress, or even if they continue to exist after job stress itself declines (Kawakami *et al.*, 1996). This discussion is closely related to the issue of the time lag in longitudinal research, which was considered before. Due to the lack of thorough research on time lags, little is known about the duration of the outcome variables.

Considering several outcome variables, depressive symptoms have been found to be characterized by periods of diminished severity. A previous study of nonpatient working population indicated that the mean duration of depressive symptoms was less than 8 months (Barrett, Hurst, DiScala & Rose, 1978). On the other hand, Dormann & Zapf (2002), analyzing different time lags, found that a long exposition time is required to establish the effects of stressors on depressive symptoms and, based on this finding, they recommended the use of long time lags (more than one year) in future research.

Moreover, job satisfaction and psychiatric distress are considered to be acute, relatively proximal reactions to environmental stress and therefore they may have not been enduring in time (Johnson, Hall, Ford, Mead, Levine, Wang & Klag, 1995). Examining the outcome variable of psychosomatic complaints, Frese (1985) asserted that it might take longer than 16 months for changes at work to affect the development of psychosomatic complaints.

Frese & Zapf (1988) distinguished between several aspects of dysfunctioning such as irritation (as an anger reaction), anxiety (as a flight and avoidance reaction),

depression (as a passive reaction) and psychosomatic complaints (as a bodily reaction) and speculated on the different time spans of the above aspects. In particular, they asserted that depression should be expected to develop within a smaller time span than illness, since there are indications that depression is an originator of somatic illness (Murphy & Brown, 1980). Furthermore, they suggested that irritation is an aspect of dysfunctioning that would react even more quickly than depression and psychosomatic complaints. Based on the above, they linked the various dependent variables to the models of the time course of cause and effect and speculated that irritation and psychosomatic complaints are more likely to follow an adjustment or a stress reaction model, whereas the development of depression and anxiety may be described with any kind of model.

The issue considered above is a complex one and one for which there is little knowledge available. The above discussion, however, clearly highlights the importance of the duration of outcome variables in the detection of longitudinal effects and stresses the importance of the time factor in longitudinal research.

Frese & Zapf (1988) suggested that moderators or intervening variables can affect the time course of the development of dysfunctioning. There may be psychological reasons such as hardiness (Kobasa, Maddi & Kahn, 1982) and sense of coherence (Antonovsky & Sagy, 1987) that influence the time variable in that an individual with high hardiness may suffer from stressors later than a person with low hardiness.

Another problem of the kind of research reported here is the question of measuring psychosomatic problems with a questionnaire. Meltzer & Hochstim (1970) analysed the relation between subjective health data and medical ratings and found that there is a larger number of false negatives than false positives in questionnaire answers.

Questionnaire measures may therefore underestimate rather than overestimate the true health problems of the respondent.

Researchers investigating the effects of stressors on mood sometimes discover stressor-specific effects. For example, severe daily events (Stone & Neale, 1984) and daily hassles (Eckenrode, 1984) affect same-day mood (Stone & Neale, 1984), but acute stressors do not. When psychological symptomatology is the criterion, differential effects dependent on the type of stressor emerge. Kanner *et al.* (1981) concluded that aggregated daily hassles were a significant predictor of psychological symptom level, but acute stressors were not. As studies indicate that acute stressors have fewer long-term consequences than chronic stressors (Loo, 1986), the nature of the stressor needs to be precisely specified.

Furthermore, the type of stressor present may determine the timing of consequences of stressors. Evidence suggests that minor life events and daily hassles have immediate, same-day effects on mood, but do not affect mood of the following day (Eckenrode, 1984; Stone & Neale, 1984). Chronic stressors may have more long-term effects, whereas the effects of acute stressors last as long as the stressors themselves last. Thus, knowledge of the type of stressor allows one to predict more precisely the nature of the outcome and its duration. From this, better prevention and intervention strategies could be designed.

A further account for the lack of longitudinal effects may have to do with the temporal course of stressors and strain. Frese & Zapf (1988) presented various plausible conceptual models of the way in which a stressor can affect psychological and physical dysfunctioning and asserted that this should be taken into consideration in longitudinal designs. Two of these models can offer a possible explanation for the failure to detect longitudinal effects in the present study.

The stress reaction model suggests that a stressor results in psychological dysfunctioning after a period of time. However, once the stressor is removed, psychological functioning improves. In support of the above model, Frese & Mohr (1987), in a longitudinal study on unemployment, found that previously unemployed blue-collar workers that indicated depression in their first interview were less depressed once they were no longer unemployed. Perhaps the stressors experienced in the first wave of data collection ceased to exist later on, thus removing their impact on ill-health and leading to no detection of longitudinal effects.

Alternatively, the adjustment model may explain these results. According to the adjustment model, dysfunctioning is reduced even though the stressor may be present, due to adjustment processes. The adjustment model can be described quite well within Lazarus' theory (Lazarus, 1966) that states that the individual develops coping strategies towards the stressors (e.g. denial or help seeking), which reduce ill-health. It should be noted, however, that apart from the latter model, all the other models assume that increases in dysfunctioning are associated linearly with exposure, something which is not quite realistic (Frese, 1988).

Combination of models is also possible, resulting in a wave-shaped curve for the description of the processes that take place. For example, if an individual that has at first experienced a reality shock, develops coping and defence strategies to deal with the new stressor, the stressor is reduced and dysfunctioning improves. However, in the long-term these strategies may prove to be inefficient, and thus lead to an increase in dysfunctioning (Frese & Zapf, 1988). Evidence for the above comes from Frese's (1985) study in which he found an increase in the correlations between stress and psychosomatic complaints in the first two job tenure years, then a reduction of these correlations in the next eight years, and then an increase again. Similarly, Warr (1990) found a high

percentage of ill-health in the first two months of unemployment, then a reduction in this percentage in the second month and an increase afterwards.

In conclusion, the above discussion highlights the significance of the time factor in longitudinal research and indicates that it should be thoroughly considered.

An interesting explanation that may account for the lack of longitudinal effects has to do with the spillover model. It is important to emphasize that the following discussion is highly speculative, as the present research did not use any measures on non-work activities. The spillover model postulates that workers' satisfaction with nonwork activities generalizes to the workplace. Rousseau (1997) went so far as to conclude that aspects of nonwork life might be more closely related to on-the-job behaviour than aspects of employment itself. Both work and family domains are potentially stressful. The emotional, physical and mental demands of roles within either domain may exceed the individual's coping resources. The interdependency between the two domains implies that strains experienced in one domain accumulate within a person to be experienced in the other domain (Leiter & Durup, 1996). In the same way, accomplishment or support in one domain may enhance a person's efficacy across domains. Spillover reflects two relatively distinct sets of concepts. Negative spillover between work and family is most frequently characterized by various types of work-family conflict or interference (Greenhaus & Beutell, 1985). Co-occurring negative events, such as stressors, on the same day in multiple domains (Bolger *et al.*, 1989), as well as the transmission of attitudes or moods from one domain to another (Almeida, Wethington & Chandler, 1999) have also been viewed as forms of negative spillover. Another, more recent set of concepts represents positive spillover between work and family, such as resource enhancement (Kirchmeyer, 1992) and work-family success or balance (Almeida, McDonald & Grzywacz, 2002; Milkie & Peltola, 1999). Positive spillover between work and family has been largely ignored in empirical research and policy

despite consistent evidence indicating that most working adults believe that the benefits of combining work and family outweigh the burdens or strains (Barnett, 1998). Positive spillover (Greenhaus & Parasuraman, 1999) has been found to correlate with greater job commitment, performance, and satisfaction as well as better physical and mental health (Grzywacz, 2000).

On the basis of these findings, we can speculate that the nurses may have experienced positive feelings from their family environment which may have spilled over in their work environment and therefore resulted in the failure to detect enduring effects of the stressors over time. Additional support to this is provided by Williams & Alliger (1994). Pleck (1977) introduced the idea of asymmetrically permeable boundaries between work and family and hypothesized that for women, work boundaries are more permeable than family boundaries (women are more likely to bring family demands and feelings to work than vice versa). According to this perspective, women should experience greater spillover of mood from family to work (Williams & Alliger, 1994).

It should, however, be noted that the relationship between work and nonwork factors is dependent upon the characteristics of the sample and the cross-cultural differences in attitudes toward work and nonwork factors are likely to be important as well.

As already mentioned, prospective association of demands and resources with each of the outcome variables became insignificant when the relevant outcome variable of time 1 was controlled. Although the lack of any prospective association between the core variables in the present study casts doubt on the competence of the model, the results should be considered taking into account the design of the study. Controlling for the effects of prior strain, health complaints, GHQ is an asset as by doing so the analytical focus is shifted to subsequent changes in the corresponding outcome variable (Ganster, Fox & Dwyer, 2001). The above serves in reducing the possibility that the

correlation between a predictor and an outcome variable arose from a possibly confounded covariation between the existing outcome variable and the predictor. The findings indicated that resources correlated with the outcome variables of strain, health complaints and effectiveness both cross-sectionally and prospectively but the prospective association was rendered insignificant when we controlled for Time 1 outcome variable.

An interesting point that has been put forward by Ganster *et al.,* (2001) should be mentioned, as it provides an additional plausible explanation for the lack of longitudinal effects. They assert that if dealing with an outcome variable that is relatively stable over time and this stable component is removed by controlling for prior state, then it is more difficult to demonstrate a prospective association even if a causal process exists. This happens because the causal influence between the predictor and outcome variable may have occurred at the beginning of the study and would be reflected in the covariation of time 1 predictor and outcome variable. Ganster *et al.* (2001) highlighted this potential limitation of a longitudinal design in which the relationship between two stable chronic variables is attempted to be determined but, on the other hand, it is not possible to begin measurement of the variables when the causal sequence begins. They therefore recommend the use, ideally, of a sample that is free of mental and psychological dysfunctioning at the time of the initial assessment and then begins a stable exposure to the various stressors measured.

The issue of shiftwork deserves consideration as the present study involved a shiftworking population. The literature on shiftwork indicates that shiftworkers encounter increased health and social adjustment problems that are related specifically to shiftwork (Folkard, Minors & Waterhouse, 1985; Kogi, 1985; Scmieder & Smith, 1996). Several studies indicated a link between increased risk for heart disease and exposure to shiftwork (Knutsson, Åkerstedt, Johnsson & Orth-Gomer, 1986).

Furthermore, job satisfaction has been found to be adversely influenced by shiftwork (Frost & Jamal, 1979). Walker (1985) asserted that the problems that are associated with shiftwork interact with the stress and health of the working individuals. On the other hand, research on shiftwork has suggested that shiftworkers are less likely to report job-related strains because they see the negative effects as unavoidable, indicating a response bias in shiftworking populations (Moore-Ede & Richardson, 1985). In their study Smith, Colligan & Tasto (1982) found that although shiftworkers did not report more health problems, there was a higher incidence of absenteeism due to health reasons in the same group. Furthermore, it is possible that workers that experienced difficulty in adjusting may have self-selected themselves out of shiftwork (Moore-Ede & Richardson, 1985), therefore, the remaining shiftworkers may not differ from the non-shiftworkers on the reported strain measures (Schmieder & Smith, 1996).

It is important, therefore, to take into consideration issues relating to shiftwork which may affect the results independently of other factors.

Overall, the results of the present study are consistent with other studies (Carayon, 1993; Ganster, Fox & Dwyer, 2001) that failed to provide longitudinal support for the demand – control model. Moreover, Dormann & Zapf (1999) in a review of the literature found several studies of social support testing its moderating effect in a longitudinal framework (Brenner, Sorbom & Wallius, 1985; Bromet, Dew, Parkinson & Schulberg, 1988; Daniels & Guppy, 1994; Digman &West, 1988; Fisher, 1985; Frese, 1999; Theorell, Orth-Gomer & Eneroth, 1990). They noted that main and moderating effects are more difficult to demonstrate in longitudinal analyses in which prior states of mental health are controlled and concluded that not a single study convincingly demonstrated the moderating effect of social support. Several studies did not report any moderating effects, others did find interactive effects but these did not reach conventional significance levels or the number of significant effects was only little

above chance. Exceptions were the studies of Daniels & Guppy (1994), Frese (1999) and Theorell, Orth-Gomer & Eneroth (1990). In conclusion, the evidence today does not allow the conclusion that moderating effects of social support occur (Dormann & Zapf, 1999).

As noted before, the results have shown a marginally significant beneficial effect of job demands on health. We can only speculate as to the reasons for the above effect. As mentioned earlier, Warr (1987) proposed that demands that are either very high or very low will have a negative effect on well-being. Therefore, tasks which provide the worker with an adequate amount of job demands, will be perceived by the worker as challenging, rather than stressful (Frankenhaeuser & Gardell, 1976). This may partially explain the fact that demands were perceived as being beneficial to the workers.

An alternative explanation for the above finding is put forward by Fox, Dwyer & Ganster (1993) who argued that two individuals facing identical objective demands, can appraise them differently. Therefore, various individual differences variables, such as ability and prior experience with the demanding situation, can account for these perceptions. As Jex & Beehr (1991) recently argued, the exploration of the process by which individuals translate their work environments into cognitive appraisals of demands thus remains an important task for researchers in the stress area. Furthermore, Ganster (1989) reported that experiments in participative goal-setting suggest that workers, when given the option, might actually impose higher demands on themselves than otherwise would have been imposed. Thus, in several circumstances, job demands may prove to be beneficial instead of threatening.

8.7.3 Effects of effort

The negative impact of effort observed deserves consideration. Specifically, effort was demonstrated to increase strain. As previously noted, effort is essentially a

regulatory process which, if it is accompanied by control, it remains within acceptable limits and it accompanied by positive affects. However, if the level of demand becomes too high and as a consequence there is no possibility of self-regulation or mobilization of adaptive systems, a stress reaction is observed (Meijman & Mulder, 1998). Meijman (1989, 1991) found that after individuals have been working for half a day, therefore having already expended an amount of effort, show physiological reactions that do not relate to feelings of activation but to feelings of tension. Thus, it appears that depending on the psychophysiological state of the individual and the duration of the load, the rise in adrenaline can either be related to the active mobilization of work capacities to meet the demands, or may turn into a stress reaction with feelings of tension. Frankehaeuser (1979) called this "effort with distress". This corresponds to the strain mode of demand management which is characterized with striving to overcome environmental demands and is associated with an increase of resources (Hockey, 2000; Kahneman, 1973). Feelings of tension and fatigue are usually associated with a high strain work day. Additionally, there is an increase in cortisol and an increased likelihood for individuals to spillover the effects in the period following work, therefore experiencing difficulty to sleep or relax (Frankenhaeuser, 1986; Hockey, 2000; Rissler & Jacobson, 1987). Hockey *et al.* (1996), in their study of junior doctors, found that the above mode of demand management is associated with work that is characterized by high demands.

Additionally, the results indicated longitudinal enhancing effects of effort and resources on the outcome variable of strain. This is a counterintuitive finding and will be considered further. As has been previously noted, effort expenditure is accompanied by positive feelings as long as control is also possible. The above result, however, indicated that high effort, in the presence of high control, enhanced the effects of demands on strain.

The most plausible explanation for such a finding involves the consideration of the negative effects of having high control in the case of emotional demands (Schaubroeck & Fink, 1998). As has been previously considered, Fox *et al.* (1993) speculated that when nurses are confronted with emotionally tense and negative events, believing that they have little control over the situation enables them to make situational attributions of failure rather than internal attributions of failure. Consequently, having high control over these emotional situations, they will contribute to internal attributions of failure and will experience more negative feelings.

The findings of the longitudinal analysis mainly revealed that effort had a beneficial effect on the individual's well being as it was associated with an increase in effectiveness. Additionally, a suppressing effect of effort was indicated for the outcome variables of job satisfaction and GHQ. These findings largely coincide with the cross-sectional findings from the main study and the pilot study that indicate the operation of a direct, active coping mode, the so-called effortful coping which is accompanied by feelings of activation and indicates active engagement of the individual with the work task (Hockey, 2000). However these findings are very significant as they indicate a longitudinal association of active coping with increased effectiveness.

8.7.4 Conclusion

The present results underscore the importance of thorough consideration of the time component in the design of longitudinal studies. In chapter 9, additional issues pertaining to longitudinal designs will be discussed.

CHAPTER 9

GENERAL DISCUSSION

9.1 Overview and summary of findings

The present study was undertaken in order to examine the demand – control model by means of an incorporation of a descriptive measure of job demands and a more focused measure of job control, following the recommendations of Wall *et al.* (1996). The model was assessed using a homogeneous research group and our outcome measures included mental and physical health outcomes and job-related outcomes. We examined the demand – control model both cross-sectionally and longitudinally. The diary-based design that was employed presents a particular strength of the present study, as it offers rich analytic potential and facilitates the thorough examination of the model. We therefore tested the model comprehensively using multiple analytic procedures. To the best of our knowledge this is one of the few studies that used a diary-based framework for the assessment of the demand – control model. Two powerful and reliable analytic procedures, aggregated analysis and standardized pooled within-person analysis, were performed on the diary data, offering an additional methodological advantage over previous studies on the model.

An additional asset of the present study was the examination of effort. There is a growing consent on its active role in the active management of demands and therefore its consideration in studies examining work demands is considered essential.

The findings indicated no prospective association between the core variables, both on the questionnaire and the pooled diary and aggregated diary data. In addition, cross-sectionally, no significant interactive effects were found for the questionnaire and the aggregated diary data. On the other hand, the standardized pooled analysis of the

diary data provided partial support for the demand – control model. The presence of an interaction substantiates the core effects of high demands and low control. Fundamentally, interactive effects were found for this powerful within-individual analytic procedure. An additional significant finding involves the cross-sectional main and interactive effects of effort on the outcome variables.

9.2 Implications for the Demand – Control model

The present study aimed at providing a thorough assessment of the demand – control model. Despite its popularity and intuitive appeal, the model has proved difficult to validate in the workplace. The central notion of the model that demands and control produce interactive rather than additive effects, generated considerable controversy. Previous criticisms were taken into consideration and a number of improvements over previous research were incorporated in the present research. As previously noted, a more focused measure of job control was used rather than the broader measure of decision latitude which combines control with the arguably different concept of skill variety. Purely descriptive measures of demands and control were included in order to reduce the possibility of common method variance. The use of two research instruments, diaries and questionnaires, offered rich analytic potential and enabled the inclusion of a number of additional measures, thus facilitating the thorough examination of the model.

The longitudinal component yielded important information on the causality of the relationships between work characteristics and well-being. The inclusion of measures of the demand, control and support characteristics at each follow-up enabled us to determine whether the lack of predictive power in prior studies is attributable to changes in the work characteristics over time (Van der Doef & Maes, 1999). The lack of

support of the interactive hypothesis in studies using personnel managers' ratings of work characteristics (Dwyer & Ganster, 1991; Stansfeld, North, White & Marmot, 1995) suggests that the way in which the individual experiences the work characteristics is crucial to their effects. Taking the above observation into account, we used self-report measures that required minimum cognitive and emotional processing, therefore providing a more objective assessment of work characteristics. Occupation-specific measurement of demands was used, as it has been suggested that it could improve the predictive and explanatory power of the model (Kasl, 1996). Finally, a homogeneous research group with sufficient variability in work characteristics was selected in order to avoid the confounding effects of variables such as socioeconomic status.

Despite our improvements the hypothesised demand – control model was only partially confirmed. Given the methodological strengths of the study, our findings cast doubt on the scientific and practical utility of the model.

The model identifies two crucial job aspects in the work situation: job demands and job control. Social support was later included in the model (Johnson, 1986), thereby acknowledging the need for any theory of job stress to assess social relations at the workplace (Karasek, 1997). The simplicity of the model is considered to be one of its assets. However, the present study used complex analyses, several hundreds thousands of observations, two different research instruments and was extented over a lengthy period of time in order to assess an essentially simple model. Considering the above, one may start questioning the practical importance of the model.

In light of the present results, one would argue that apart from the central role of social support, the role of effort whould not be ignored in producing favourable or unfavourable outcomes. Our findings reinforce the view that effort is an important determinant of how people respond to stressors and indicate that predictive models of work stress need to inlcude additional variables rather than solely demands and control.

The large number of studies which have been conducted testing Karasek's model and the small effects that have been found suggest that it is time to move on from a narrow focus on just two job characteristics and a continuous search for interactive effects. Models that incorporate a wider range of variables would account for more variance in strain and ultimately be more useful in job redesign (Fletcher & Jones, 1993). Parkes (1991) also draws attention to the fact that the factors that relate to strain do not just reside in the job environment and concludes that the ways job characteristics interact with the individual characteristics may ultimately be more important and useful.

The issue of vulnerability or resistance to unfavourable work characteristics needs to be further explored as prior research has identified populations which are vulnerable or resistant to negative work conditions. Therefore, rather than focusing only on the work characteristics that the model indicates, an investigation of the role of individual characteristics such as coping style, locus of control and need for autonomy in the relationship between work environment and employee well-being is highly recommended.

In conclusion, the hypothesised interactive effect of three job characteristics of the work situation, which is considered to be the strength of the model, is at the same time its weakness (De Jonge and Kompier, 1997). Present findings, in accordance with previous findings on the model, indicate that other job characteristics may also be important predictors of differences in health.

Our findings draw attention to the possibility of nonlinearity and raise concern for the assumption of linear relationships between the main variables the model. Warr (1990) points out that Karasek's (1979) results suggest that the relationships between the main variables in the model are in fact curvilinear and not linear as postulated. This issue is considered further below, as it is a possibility that challenges the notion of

linearity in the demand – control model. The examination of the nature of the relations between the main variables merits close attention in future studies.

A last issue that requires consideration has to do with the practical value of the model. The model implies that the enhancement of job control and social support would improve employee well-being without any repercussions for the level of job demands. Despite the significance of such an assumption, very few intervention studies have investigated such a possibility (Landsbergis and Vivona-Vaughan, 1995) and these produced inconclusive results. The practical value of the model should be further evaluated through quasi-experimental studies. The significant finding would be to demonstrate that certain work conditions substantially improve the health and well-being of employees, rather than indicating which work conditions are associated with ill-health (Van der Doef & Maes, 1999).

In conclusion, the interactive effect hypothesised by the demand – control model is the element that makes it unique and interesting. This effect was only partially supported in the present research. Our findings provided strong support for the additive rather than the interactive aspect of the model, despite the methodological and theoretical improvements.

9.3 Methodological contributions

The purpose of the following discussion is threefold. We will firstly consider several methodological contributions and limitations of the present study, relating to the demand – control model, longitudinal studies and occupational stress research. We will then discuss the interesting implications of the present study and finally we will consider directions for future research.

As outlined earlier, the demand – control model that was explored in the present study has been criticized on several grounds. Several of the criticisms have been taken into account in the design of the present study and will be discussed in detail below. They present particular strengths of the study design and contribute to the reliability and validity of the findings.

Several researchers have argued that the reason for the failure to detect interactive effects may be related to sampling issues (de Jonge *et al.*, 2000; Wall *et al.*, 1996). The nature and the size of the research group may have significant implications for the confirmation of the model. Additionally, while the representativeness of the sample and a high response rate are usually considered positive research characteristics, Kristensen (1995, 1996) argued that the variation in exposure is the most decisive factor in the context of the demand – control model.

A number of researchers have highlighted the problem of reduced likelihood of the detection of interaction effects in large heterogeneous samples (de Jonge & Kompier, 1997; Dollard, 1997; Sparks & Cooper, 1999), as a result of the conflict between the diversity of individual occupations and the diversity of job characteristics. Studies on the occupational level do not take into account the variability of job characteristics within occupations (Ganster & Fusilier, 1989). Another reason why diversity among occupational groups may reduce the likelihood of finding interactions is due to additional higher-order moderating variables that may be operating among these groups. For example, some occupations give more opportunities for implementing perceived control than others (de Jonge *et al.*, 2000).

Based on the above considerations, the appropriate sample for testing the demand – control model has to be homogeneous in variables that might act as confounders, but heterogeneous in exposure. Our choice of the nursing profession for the examination of the model is considered ideal in those terms (Bourbonnais, Comeau

& Vézina, 1999). Due to the variety of specialties in nursing, nurses are expected to encounter the full range of exposure to many work factors that may be determinants or moderators of strain, such as demands and control (Haynes *et al.*, 1999). Ganster & Fusilier (1989) asserted that samples of nurses show as much variability in demands as multi-occupation samples. In addition, since nursing is relatively homogeneous in terms of social class, the confounding effect of socio-economic status is restricted (de Jonge *et al.*, 1999).

The conceptualization and measurement of the two basic concepts of the model, job demands and job control, has been a point of criticism. This has been highlighted in a previous section. Two points regarding job demands that are relevant to the present study should be mentioned, as they are improvements over prior research. A number of researchers have recommended the occupation-specific measurement of job demands (de Jonge *et al.*, 1999, 2000). In particular, Söderfeldt *et al.* (1997) suggested the development of a measure of emotional demands for human service organizations, in order to reflect the nature of their work. In addition, physical workload has been acknowledged as one of the main features of health care organizations (Hockey, 2000). The current study, which involved a nursing population, incorporated measures of both emotional and physical demands.

Moreover, it has been argued that if job demands are measured using affective judgments, there is the possibility of confounding demands and strains, resulting in difficulty in uncovering interaction effects (de Jonge *et al.*, 2000). Based on the above, the assessment of job demands in the present study involved minimum cognitive processing, with items that were precisely defined and as neutral as possible. In addition, the response categories were frequency-based rather than intensity-based (Frese & Zapf, 1988; Wall *et al.*, 1996).

Issues pertaining to the conceptualization and measurement of the job control concept have been previously considered. The more focused measures of timing and method control (Jackson *et al.*, 1993) have been incorporated in the present study, since they relate to a wide range of jobs and have been regarded to be improved measures of job control (Wall *et al.*, 1996). Again, on the same basis as for the job demands measure, job control was assessed by measures requiring minimum affective judgments.

The methodological shortcomings of studies in occupational stress research have been discussed by a number of authors (Frese & Zapf, 1988; Kasl, 1986; Spector, 1992). Suggestions for improvement include the use of longitudinal studies in order to analyse causal effects, to take into account third variables that may affect the stressor-strain relationship and, finally, to consider the time lag necessary for the stressor to develop its effect on strain (Dormann & Zapf, 2002).

The present study has addressed several of these issues. Fundamentally, one of the main positive features of the study was the longitudinal design that was employed. This design facilitated the examination of causality between the variables under consideration and enabled us to control for the effect of certain third variables that may have spuriously influenced the relationship between stressors and strain. Following the recommendations by Zapf *et al.* (1996), third variables such as the background factors of age and marital status were included in the equation, in order to partial out their effects. Although data on tenure and parenthood were gathered, a decision was made against their inclusion in the analysis, due to many missing data.

The time lag employed in the present study was considered in chapter 7, in light of the findings that indicated no longitudinal association between demands, resources and effort and the outcome variables. When a time lag is decided, both the time course associated with different kinds of stressors and different time spans of both outcome variables and stressors should be considered (Frese & Zapf, 1988; Ingledew, Hardy &

Cooper, 1997). The time spans are different for different stressors. Ten years of shiftwork may be a typical problematic time span in the development of psychosomatic problems whereas mental load is assumed to have an impact on dysfunctioning within a range of some months. One explanation for these differences in time span between stressors might be that they pose different degrees of stress intensity (Kelloway & Barling, 1994). The decision on the appropriate time lag requires a strong theoretical background on the duration of the variables under consideration and since multi-wave studies are infrequent, the knowledge on the duration of the variables remains limited. The adequacy of a time lag can be examined using multiple waves of measurement and this will be considered further later on.

An additional asset of the present study was its diary-based design. The problem of faulty memory that is central in retrospective questionnaires is minimized with the use of diaries, thus contributing to the reliability and validity of research. Although one could argue that diaries that are based on self-report may generate fictitious data and impose a burdensome task to the individuals, it should be stressed that the naturalistic character of information obtained through self-report data is difficult to obtain in laboratory settings (Cutrona, 1986).

As described earlier, the diary data were explored using two different analytic approaches, aggregation (Epstein, 1979, 1980, 1983, 1986) and standardized pooling (Pedhazur, 1982; Sayrs, 1989). The advantages of these procedures have been discussed in detail in chapter 3. The powerfulness of aggregation lies in its ability to provide more reliable, valid and generalisable data, as it reduces error of measurement by canceling out the uniqueness of individual subjects. Standardized pooling elicits valuable information on the microprocesses in research, as it assesses within-person variation over time.

9.4 Limitations

The fact that our sample consisted of only nursing population and only females poses a threat to external validity of the present study (Cook & Campbell, 1979; Dormann & Zapf, 1999). As noted earlier, the use of a specific occupational group is advantageous due the avoidance of the confounding effects of occupational differences. On the other hand, it has the inherent shortcoming that the results cannot be generalised to other occupations. Further studies are warranted employing both males and females in a cross section of occupations to cross-validate our findings (Melamed *et al.*, 1991; Rodriguez, Bravo, Peiro & Schaufeli, 2001).

Zapf *et al.* (1996) recommend structural equation modeling as the most appropriate procedure in longitudinal designs (Dwyer, 1983; James & James, 1989; Link & Shrout, 1992). Reciprocal relationships can be incorporated into the model and simultaneous estimates of causal relationships can be obtained. Additionally, it possesses the capability to take unmeasured third variables into account. However, such models often require certain constraints to be put on the models, e.g. stationarity restriction. As indicated by Moyle (1998), the examination of structural equation modeling longitudinally requires large sample sizes. Taking into consideration the high respondent drop-out that is common in longitudinal studies (Williams & Podsakoff, 1989), an initial large sample size would be required. In addition, Zapf *et al.* (1996) recommend the explicit measurement of third variables whenever possible, due to limited practical experience with complex factor models and due to possible estimation problems. Hierarchical regression analysis allows the inclusion of third variables in order to control for their potential biasing effects. Additionally, synchronous causal relationships can be identified with hierarchical regression analysis (Zapf *et al.*, 1996).

The regression model used in the present study did control for third variables and tested synchronous causal relationships as well as lagged effects.

The measures used in the present study to assess the predictors and outcome variables were self-reports. This inevitably raises concerns about common method variance (Bourbonnais *et al.*, 1999; Schmieder & Smith, 1996). This bias cannot be ruled out but it should be noted that there is no objective measurement strategy for job characteristics currently available. Even expert ratings of job characteristics that are considered objective, underestimate the job characteristic variance that is associated with psychological strain. Additionally, as outlined earlier, this approach is influenced by observers' bias, such as incomplete and partially invalid information due to the limited time of the observation and halo and stereotyping effects (Frese, 1985; Semmer, Zapf & Grief, 1996). Conversely, it has been suggested that perceptual measures may be better predictors of psychological distress than objective stressors that might not be perceived or felt like stressors by workers (Bourbonnais, Brisson, Vézina & Moisan, 1996). In addition, research has shown that self-report provides a fairly accurate account of objective job characteristics (Elsass & Veiga, 1997). We did try to reduce the problem of self-report by assessing the job characteristics with items that required minimum cognitive and emotional processing. In addition, we measured the indicators with differing response formats. Nevertheless, the use of multimethod measurements is recommended, combining self-report measurements with physiological and behavioural measures (de Jonge, Janssen & Van Breukelen, 1996; Dwyer & Ganster, 1991; Fox *et al.*, 1993; Rodriguez *et al.*, 2001; Xie, 1996). The use of physiological measures in stress research is of great importance and will be considered further below.

Another issue linked to the use of self-report measures is the possible presence of a third variable that influences both the dependent and the independent variables. Negative affectivity (Watson, Pennebaker & Folger, 1987), a stable predisposition to

experience aversive emotional states, has been measured by several investigators in order to control for this potential bias (Bourbonnais *et al.*, 1999; Chen & Spector, 1991; Stansfeld, North, White & Marmot, 1995). However, Spector, Zapf, Chen & Frese (2000) in a recent metaanalysis demonstrated that controlling for negative affectivity may also lead to an underestimation of the stressor-strain relationships.

The possibility of a selection bias in our sample should be considered, due to the loss of participants in the second wave of data collection. This is not so much a threat to the internal validity of the study, which dealt with the potential confounding variables by statistical control (Ingledew *et al.*, 1997). Rather, it is a potential threat to the external validity of the study. In order to check the stability of the results, regression analyses were carried out on the individuals that completed the diaries on both waves (at Time 1 and Time 2), after removing the individuals that did not complete the diaries at Time 2. The results of this second analysis did not differ significantly from the results of the first analysis, thus reducing the possibility of such a bias.

The present study included two waves of data collection. The reasons relate to time costraints and to the low compliance of the nurses, resulting in high refusal rates for participation. It has been asserted that having only 2 waves seriously constraints the analysis of change (Barnett & Brennan, 1997). Barnett & Brennan (1997) distinguish between two components in any job condition, the *stable component* which is the time invariant component or the average level, and the *time varying component* which represents the deviations from the average level. Each of these two components or both these components may be predictive of change in strain over time. Thus, having multiple data points facilitates the dissaggregation of the two components and the estimation of the relationship between both the time-variant and the time-invariant component of each job condition and change over time. On the basis of the above, a multi-wave longitudinal study is highly recommended for future research. Additionally,

as noted earlier, a multi-wave design will provide information about the time lag necessary for effects to take place.

Two issues relating to diary completion should be mentioned. These involve the possibility of sensitisation effects and fatigue effects. These issues have been considered in a previous section therefore we will limit ourselves to the present study. Regarding sensitisation effects, it should be noted that previous research has shown that studies that involved diary keeping for non-health related behaviours have found no change over time in the phenomena being recorded (McKenzie, 1983). Verbrugge (1980), however, offers some potential solutions for sensitisation effects. If these effects are temporary, or remain constant after a certain period of time, several sample diaries can initially be included, which are not to be included in data analysis. After the sensitisation effects level off, the diaries that are intended for analysis could be administered.

Alternatively, a control group that receives the diary at only the initial and final time points can be included, thus allowing differences in changes across time between the two groups that might be attributed to the diary procedure to be assessed (McKenzie, 1983). However, as researchers tend not to report information regarding fatigue and sensitisation effects, the data on which such design decisions should be made are lacking (Verbrugge, 1980). Although such solutions require high compliance from the sample and a long period of time, they pose issues for consideration in future diary-based research.

Fatigue effects were also considered in the present study. As a check of possible fatigue effects, the means of the first 8 days of diary completion were calculated and the analyses were conducted on these more reliable means. On the basis of the analysis that indicated no different results between the means based on the 24 completion days and

the means based on the 8 completion days, the possibility of fatigue effects was rejected.

9.5 Practical implications of the present study

On the basis of the findings presented in the current study, several theoretical and practical implications emerge. Despite the limitations that have already been outlined, we believe that our study provides important new insights into the effects of work characteristics on the individual's well being. It extends and enhances our understanding of this relationship in at least two respects.

First, the results indicated, fundamentally, support of the demand – control model in the within-individual level of analysis. Given the methodological strengths of the present study this is a significant finding. The above finding has three important implications: Primarily, it underscores the significance of microprocesses involved in the study of individuals in occupational stress research and therefore highlights the need to focus on the micro-level both for future interventions and in future research. Secondly, this result indicates that differences between individuals may not be able to capture the inner dynamics of processes that may exist as a function of differences within the individual. Finally, it clearly points towards a significant direction for future research that seems promising and therefore worth exploring. This involves future use of the intra-individual methods in occupational stress research as they may lead to the development of individual-level models of job stress.

The current study was based on a limited number of observations (24 days) therefore it was not possible to conduct a solely intra-individual analysis. We would highly recommend a future longitudinal study based on a large number of individuals each with several hundred numbers of observations in order to establish reliable patterns of adaptive response for each individual (Hockey *et al.*, 1996). It is evident that such a

longitudinal study would be costly and would require time. However, its utility lies in that it may enable us to classify individuals in terms of their pattern of response to demands. Additionally, the longitudinal element would facilitate the assessment of changes in the adaptive response over time and thus enhance our understanding of the factors that mediate the response to multiple stressors (Singer & Davidson, 1986). Extending the assessment from self-reported measures to physiological measures as well, we would be able to determine individually-determined baselines of neuroendocrine and affective response to work demands. Overall, it seems that future stress research would benefit from a more thorough examination of data at the individual level.

So far, research has indicated that there are significant differences between individuals in the way they approach their work environment, and in the way they respond to increased control and social support and job demands. The present research indicates that there is variation in responses to demands, control and support within the same individual across different situations. Thus, perhaps more important than having the predisposition or tendency to respond in a certain way, is the opportunity to do so, depending on the situation. Thus, situational characteristics may determine the individuals' response to their environment, to a large extent.

Additionally, the present findings indicate that interventions should focus on the individual level rather than the organizational level. This seems intuitively appropriate, given the inherently stressful – and thus unavoidable – nature of work in health care settings, which makes it difficult to intervene in the organizational level.

As noted earlier, the second way in which our understanding of the relationships between job characteristics and well-being is enhanced involves the significant findings on the effort variable. Predominantly the results indicated that individuals were

operating on the effortful coping mode, characterised by feelings of enthusiasm and elation.

As previously discussed, sustained active coping strategies are linked to a high level of effectiveness and alertness. On the other hand, it is self-evident that operating at a very high level for any length of time may impose considerable strain and result in fatigue (Hockey, Briner, Tattersall & Wiethoff, 1989). Consequently, such a direct action demand management style is likely to result in minor health symptoms, such as headaches and colds, negative spillover from work to home, and – in extreme forms of workaholism – it may result in long-term health problems such as gastrointenstinal disorders or CHD (Hockey, 2000; Karasek & Theorell, 1990). The operation of an active coping mode is naturally expected in environments with high intolerance to errors, such as health care settings. However, as already suggested, it has important detrimental consequences for the health of the nursing staff. Based on these findings, we recommend for nurses to go for frequent health checks and psychological tests.

The within-individual analysis revealed a different demand management mode. Results indicated that individuals were operating in a strain coping mode, which is characterised by striving to overcome environmental demands and is usually linked to acceptable levels of performance and increased fatigue and anxiety. This is a control option for the individual that may be experiencing strain due to operation in the active coping mode. Overall, our findings indicate that nurses would strive to maintain acceptable performance at increased personal costs and this should be taken into account in future intervention studies.

Naturally, some individuals may operate in a direct demand management mode without any obvious signs of strain while others may suffer from strain even with making minimal effort. Stress tolerance is considered to be the main reason behind the ability of some individuals to work effectively without detrimental effects to their health

and well-being. Perhaps the important requirement is to acquire "situational flexibility" (Hockey, 2000), thus maintaining a balance between active and passive coping actions, determined by the particular situation.

9.6 Directions for future research

Traditionally, organizational psychology has conceptualized the relationships between work characteristics and well-being as linear (Hackman & Oldham, 1976). Consistent with this trend, the demand – control model assumes a linear relationship between job characteristics and employee well-being. The assumption of linearity was challenged by Warr (1990) who postulated the existence of curvilinear relationships between job characteristics and employee health, with optimal levels in the middle of the range (de Jonge & Kompier, 1997; Pelfrene, Vlerick, Kittel, Mak, Kornitzer & de Backer, 2002). Indeed, Warr (1990) empirically demonstrated the existence of nonlinear relationships between psychological demands and well-being and failed to find any interactive effects. Various studies have provided evidence for such types of relationships (de Jonge & Schaufeli, 1998; Xie & Johns, 1995).

The results of these studies demonstrate that including curvilinear relationships in the analysis of psychological phenomena provides additional and more detailed information about the nature of the relationships involved (Teuchmann, *et al.*, 1999). On the basis of the above, the examination of both linear and curvilinear relationships within the demand – control framework is highly recommended.

As previously noted, studies testing the demand – control model examined different outcomes. In the epidemiological studies the dependent variables consisted of hard medical outcomes such as coronary heart disease and the organizational studies assessed short-term outcomes such as physical symptoms and job outcomes (Ganster, Fox & Dwyer, 2001). An important advance in research on the demand –control model

would be for a longitudinal study to show that short-term outcomes could explain long-term outcomes (Kinicki, McKee & Wade, 1996).

Measures of physiological, neuroendocrine and immune system responses constitute an important category of stress outcomes. In addition, there is important evidence that they are correlated with job demands and control perceptions (Fox *et al.*, 1993) as well as occupational differences in demands and control (Schaubroeck & Ganster, 1993). The theoretical reasoning underlying the use of such measures is that they play a role in the etiology of a variety of diseases. Stress and its physiological sequelae can affect a broad range of chronic and acute conditions, ranging from minor viral infections to cancer and heart disease (Taylor, Repetti & Seeman, 1997). Thus, it is important that the measures of health outcomes are suitably broad so that they capture this wide array of health problems (Ganster *et al.*, 2001). Additionally, physiological measures of health present more objective measures and resolve the problems associated with self-report questionnaires. Future research should ideally include both self-reported and physiological measures.

Overall, several researchers have identified the need for the use of multiple data sources in the measurement of stressors and strains. Stressors may be measured via supervisor reports (Spector *et al.*, 1988) or through job analysis data (Spector & Jex, 1991; Xie & Johns, 1995). Strain may be measured by physiological indices (Fox *et al.*, 1993). Sole reliance on self-report of stressors and strains may produce an incomplete unidimensional view of the process by which stressful job conditions affect workers (Hienisch & Jex, 1998).

In a previous section we speculated on the possible positive spillover from family to work. Indeed, positive family associations may provide an equalizing element to the disequilibrium and frustration experienced during the working day. This is an intriguing possibility that deserves further investigation. More studies are needed that

employ diary or short-term repeated-measure designs to facilitate a broader understanding of the linkages between work and family (Almeida *et al.,* 2002; Allen, Herst, Bruck & Sutton, 2000). Second, the subjective quality of an individual's work and family roles, not employment and family status per se, is the critical determinant of psychological well-being (Barnett & Marshall, 1992). Third, work and family experiences have reciprocal effects; behaviour in one role is affected to some degree by experiences in the other (Barling & MacEwen, 1992). For example, spillover of mood, in which feelings caused by events in one sphere affect the other sphere, is a commonly cited phenomenon (Williams & Alliger, 1994).

Due to the changes in employee demographic characteristics and in the societal attitudes about work and family, the balancing between the work demands and family roles has become an important daily task for many employed adults (Zedeck, 1992). Over 75 % of married female professionals reported experiencing daily conflict between work and family responsibilities (Wortman, Biernat & Lang, 1991). Occupying multiple roles is associated with significant psychological benefits such as status, ego gratification and increased self-esteem (Sieber, 1974). On the other hand, this "role accumulation" may be associated with costs such as role strain, somatic complaints and psychological distress (Cooke & Rousseau, 1984; Frone, Russell & Cooper, 1992). The strength of the model for women with multiple roles needs to be further investigated (Karasek, 1997). We highly recommend the investigation of such possibilities in future research on occupational stress.

In a similar vein, cultural, socio-economic and gender-specific differences are interesting issues worth studying in the future.

Dormann & Zapf (2002) very recently discussed the issue of unmeasured third variables such as occasion factors that are completely unstable and may affect other variables in a given situation. Dormann (2001) indicated that the use of the synchronous

common factor model, which is the basic model underlying the cross-lagged panel correlation technique (Kenny, 1975) may rule out unmeasured variables as sources of spuriousness when more than two variables, each of which is measured at least twice, are analysed. The issue of unmeasured third variables is an issue to consider for future research.

Finally, it is obvious that Karasek's (1979) two-factor model is not comprehensive enough to explain stress at work. The explanation of the occurrence of negative health-related outcomes in work settings can be improved by higher order interactions between environmental factors and individual difference variables. For example, Karasek refined his initial model by including social support as a third dimension (Dollard & Winefield, 1998; Karasek & Theorell, 1990).

A further potential explanation, and a more theoretical one, arises from the observation that people adapt in different ways to the environment and that these differences can influence the work stress process (Parkes, 1990, 1994; Siegrist, Peter, Junge, Cremer & Seidel, 1990). Thus, individual difference variables might influence the nature of the demand – control relationship (Karasek, 1979; Xie, 1996). It should be noted, however, that situational variables are equally important. Parker & Sprigg (1999) found that the inclination to reduce job demands by individuals with proactive personality was not sufficient on its own, but the opportunity to reduce job demands, perhaps via the presence of high job control, had to be present as well. This coincides with Peters and O'Connor's (1980) assertion that the impact of personal variables such as motivation and personality is constrained by situational variables in the workplace such as the degree of job control.

Moreover, it has been argued that the inclusion of individual differences in studies of stress and health, is not by itself an adequate sufficient strategy for meaningfully improving stress research (Kasl & Rapp, 1991). Investigation of

individual differences variables should combine with greater attention to, first, aspects of research design, and, second, to the possible underlying mechanisms of causation. Some possible design issues include the creation of homogeneous subgroups of subjects, such as with respect to baseline health and mental health characteristics (including history) so that the subsequent course of health status changes may be more clearly interpretable. Additionally, subjects should be selected not to represent the total community, but to be representative of those who have been exposed to specific situations and experience. Finally, data collection should ideally be scheduled in relation to the onset of exposure, so that one maximises the chances of detecting the various phases of impact and adaptation. Elsewhere (Kasl, 1983) these issues were discussed under the general recommendation of searching for opportunities to carry out "natural experiments". The issue of greater sensitivity to underlying biological mechanisms means that instead of blindly including some selected personality trait measures, we should also attempt to formulate explicitly a plausible pathway of influence. This will suggest to us additional variables which need to be assessed (e.g. health habits, medications, medical care received) and, possibly, when they need to be assessed and how (Kasl & Rapp, 1991).

9.7 Conclusion

The demand – control model has stimulated much research over the years. It has been considered to be both appealing and useful, mainly due to the hypothesised interaction effect. The present study was intended to provide a stronger test of the model than has been provided by the typical cross-sectional design. Given the theoretical and methodological improvements over prior research the findings cast some doubt on the predictive power of the model. Clearly, similar thorough investigations must be conducted in order to conclude on its utility.

Nevertheless, the present research addressed several important issues that are worth mentioning. The use of two powerful data analytic procedures, aggregation and standardised pooling, has proved to be both valuable and informative regarding the relationship between work characteristics and well-being. The importance of microprocesses involved in the study of individuals is strengthened by the present research. On the other hand, the potential loss of meaningful information on the relationships between the variables of interest through the use of aggregation was demonstrated and this should be taken into account in future research..

The longitudinal element of the present study improved our confidence regarding the findings and underscored the need for thorough consideration of the time component in future longitudinal research in order to reach more reliable conclusions.The need for future use of longitudinal diary methodologies and intraindividual research is highlighted.

Finally, the present research indicated the crucial role of effort in determining the well-being of the individual. Effort is an important variable implicated in the regulation of job demands and our results indicate that it should not be ignored in future research on occupational stress.

Summarising, future research should address theoretical questions concerning the demand – control model, as well as identify the work characteristics that are crucial to the creation of "healthy work situations".

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ΕΡΓΑΣΙΑ ΚΑΙ ΥΓΕΙΑ ΤΟΥ ΝΟΣΗΛΕΥΤΙΚΟΥ ΠΡΟΣΩΠΙΚΟΥ

Ερωτηματολόγιο

Κωδικός _____

1η Ημέρα Ημερομηνία / /

ΜΕΡΟΣ 1: (να συμπληρωθεί στο τέλος της βάρδιας)

Ώρα συμπλήρωσης_____

Ώρα που αρχίζετε την δουλειά σας_____ **Ώρα που τελειώνετε την δουλειά σας**_____

Συνολικός χρόνος διαλειμμάτων_____ **ώρες/λεπτά**

1.1 Εργασιακές εμπειρίες

Στην δουλειά σήμερα ...	καθόλου πάρα πολύ
Είχα έλεγχο του πότε και του τί δουλειές θα έκανα	1 2 3 4 5 6 7 8 9
Είχα να κάνω δουλειές που χρειαζόντουσαν μεγάλη αυτοσυγκέντρωση	1 2 3 4 5 6 7 8 9
Υπήρχαν συγκρούσεις με συναδέλφους	1 2 3 4 5 6 7 8 9
Είχα υποστήριξη από τους συναδέλφους μου	1 2 3 4 5 6 7 8 9
Αντιμετώπισα προβλήματα με τα μηχανήματα και τεχνικές υπηρεσίες	1 2 3 4 5 6 7 8 9
Είχα να πάρω κάποιες δύσκολες αποφάσεις	1 2 3 4 5 6 7 8 9
Δούλεψα για μεγάλο χρονικό διάστημα χωρίς να κάνω διάλειμμα	1 2 3 4 5 6 7 8 9
Μπορούσα να αποφασίσω για το πώς να κάνω τις δουλειές που είχα	1 2 3 4 5 6 7 8 9
Είχα αρκετό χρόνο για διαλείμματα	1 2 3 4 5 6 7 8 9
Οι συνάδελφοί μου με βοήθησαν πολύ όταν χρειάστηκα βοήθεια	1 2 3 4 5 6 7 8 9
Χρειάστηκε να φροντίσω ασθενείς και τους συγγενείς τους	1 2 3 4 5 6 7 8 9
Είχα πολλές βαριές δουλειές να κάνω-κουβάλημα, μεταφορές κ.λ.π.	1 2 3 4 5 6 7 8 9
Έπρεπε να βοηθήσω άλλους ανθρώπους που ήταν αναστατωμένοι	1 2 3 4 5 6 7 8 9
Οι ενέργειες μου βοήθησαν έναν ασθενή που ήταν πολύ άρρωστος	1 2 3 4 5 6 7 8 9
Είχα να κάνω πολλή διοικητική δουλειά	1 2 3 4 5 6 7 8 9
Έπρεπε να δουλεύω γρήγορα την περισσότερη ώρα	1 2 3 4 5 6 7 8 9
Η δουλειά μου είχε πολλές σωματικές απαιτήσεις	1 2 3 4 5 6 7 8 9
Μπορούσα να αποφασίζω με ποιά σειρά και πότε θα άλλαζα δραστηριότητες	1 2 3 4 5 6 7 8 9

Παρακαλώ γυρίστε σελίδα

ΜΕΡΟΣ 2: (να συμπληρωθεί το βράδυ)

Ώρα συμπλήρωσης _____

2.1 Γενική διάθεση

Πώς νοιώσατε σήμερα ;

Ένοιωσα . . .	καθόλου							πάρα πολύ	
ενοχλημένος	1	2	3	4	5	6	7	8	9
ήρεμος	1	2	3	4	5	6	7	8	9
χαρούμενος	1	2	3	4	5	6	7	8	9
θλιμμένος	1	2	3	4	5	6	7	8	9
ενεργητικός	1	2	3	4	5	6	7	8	9
ενθουσιασμένος	1	2	3	4	5	6	7	8	9
εκνευρισμένος	1	2	3	4	5	6	7	8	9
γεμάτος ζωντάνια	1	2	3	4	5	6	7	8	9
δυστυχισμένος	1	2	3	4	5	6	7	8	9
χαλαρωμένος	1	2	3	4	5	6	7	8	9
σε υπερένταση	1	2	3	4	5	6	7	8	9
κουρασμένος	1	2	3	4	5	6	7	8	9
ανήσυχος	1	2	3	4	5	6	7	8	9
εξαντλημένος	1	2	3	4	5	6	7	8	9

2.2 Γενικές ενοχλήσεις υγείας

Νοιώσατε κάποιο από τα παρακάτω συμπτώματα (έστω και ελάχιστα) τις τελευταίες 24 ώρες;
[0 = καθόλου; 1 = λίγο; 2 = πολύ]

πόνο στη μέση	0 1 2	αδυναμία	0 1 2
σουβλιές στο στήθος	0 1 2	ζαλάδα	0 1 2
συμπτώματα κρυολογήματος	0 1 2	πονοκεφάλους	0 1 2
ανακατεμένο στομάχι	0 1 2	είχατε περίοδο	0 1 2
κούραση στα μάτια	0 1 2	πόνους περιόδου	0 1 2
έλλειψη ζωτικότητας	0 1 2	μειωμένη όρεξη	0 1 2
μυικούς πόνους	0 1 2	υπνηλία	0 1 2
προβλήματα στο να συγκεντρωθείτε			0 1 2
δυσκολίες στην λήψη αποφάσεων/ προγραμματισμό			0 1 2
ξεχνούσατε να κάνετε πράγματα			0 1 2

2.3 Αποτελεσματικότητα

Πόσο αποτελεσματικός/ή υπήρξατε σήμερα (στο να κάνετε την δουλειά σας)

Στην δουλειά σήμερα, ήμουν.....		
καθόλου αποτελεσματικός	1 2 3 4 5 6 7 8 9	πολύ αποτελεσματικός

2.4 Προσπάθεια

Πόση προσπάθεια κάνατε για να ανταποκριθείτε στις απαιτήσεις της δουλειά σας ***σήμερα;***

Στην δουλειά μου σήμερα.....	*καθόλου*							*πολύ συχνά*	
Προσπάθησα να κάνω όλα όσα μου ζητήθηκαν	1	2	3	4	5	6	7	8	9
Συγκεντρώθηκα στο να κάνω τις δουλειές που ήταν πιο απλές	1	2	3	4	5	6	7	8	9
Κατέβαλα μεγάλη προσπάθεια για να συνεχίζω να δουλεύω όλη μέρα	1	2	3	4	5	6	7	8	9
Άφησα μερικές από τις πιο απαιτητικές δουλειές για αργότερα	1	2	3	4	5	6	7	8	9
Δούλεψα πολύ σκληρά για να ξεπεράσω τα προβλήματα της δουλειάς	1	2	3	4	5	6	7	8	9
Προσπάθησα να μην ζητάω πολλά από τον εαυτό μου	1	2	3	4	5	6	7	8	9

2.5 Αρρώστειες/Φαρμακευτική αγωγή/Θεραπεία

Παρακαλώ πείτε μας αν είστε εκτός δουλειάς όταν είστε άρρωστοι, αν έχετε πάρει κάποιο φάρμακο (παυσίπονο κ.λ.π.) τις τελευταίες 24 ώρες. Επίσης αναφέρετε με συντομία οποιαδήποτε καινούργια φαρμακευτική θεραπεία ακολουθείτε (ποιά και για πόσο χρονικό διάστημα) και αν επισκεφτήκατε τον γιατρό σας.

_____

Συμπληρωματικά σχόλια:

ΣΗΜΕΙΩΣΕΙΣ ΓΙΑ ΤΗΝ ΣΥΜΠΛΗΡΩΣΗ ΤΟΥ ΕΡΩΤΗΜΑΤΟΛΟΓΙΟΥ

ΠΑΡΑΚΑΛΩ ΔΙΑΒΑΣΤΕ ΠΡΟΣΕΚΤΙΚΑ ΤΙΣ ΠΑΡΑΚΑΤΩ ΣΗΜΕΙΩΣΕΙΣ

Γενικές πληροφορίες

Παρακαλώ διαβάστε τις παρακάτω σημειώσεις πριν αρχίσετε την συμπλήρωση του ερωτηματολογίου και ανατρέξτε σε αυτές όποτε δεν είστε σίγουροι για το τί σημαίνει μια ερώτηση. Το ερωτηματολόγιο είναι φτιαγμένο έτσι ώστε να καλύπτει ένα ευρύ πεδίο δραστηριοτήτων και εμπειριών. Ταυτόχρονα είναι φτιαγμένο έτσι ώστε να χρειάζονται ελάχιστα λεπτά καθημερινά για την συμπλήρωσή του. Για να μειωθούν τυχόν ασάφειες παρακαλώ προσπαθείστε να πάρετε μια γενική ιδέα του σε τί αναφέρεται καθεμιά από τις παρακάτω έννοιες. Επίσης, προσέξτε όταν δίνετε την απάντησή σας. Προσπαθείστε να χρησιμοποιείτε *όλο το σύνολο των αριθμών* (1-9 για τα περισσότερα τμήματα του ερωτηματολογίου, 0-2 για το τμήμα **2.2**), έτσι ώστε να αντανακλάται η ποικιλία των εμπειριών της εργασίας σας. Επίσης, προσπαθείστε να είστε όσο πιο ακριβείς γίνεται. Όσον αφορά τις υποκειμενικές εμπειρίες, φυσικά, δεν υπάρχουν σαφή όρια – οι έννοιες αναφέρονται μόνο στην δική σας ευρύτητα εμπειριών. Άρα στο τμήμα **2.1** του ερωτηματολογίου, αν αισθάνεστε πολύ κουρασμένος, σημειώστε έναν μεγάλο αριθμό (π.χ. 7 ή 8), αν δεν αισθάνεστε σχεδόν καθόλου κουρασμένος σημειώστε έναν μικρό αριθμό (π.χ. το 1 ή 2). Σ'αυτήν την κλίμακα, ως παράδειγμα των κλιμάκων που κυμαίνονται από 1 έως 9, ο αριθμός 1 σημαίνει *ότι δεν αισθάνεστε καθόλου κουρασμένος/η* και ο αριθμός 9 σημαίνει ότι *αισθάνεστε τόσο κουρασμένος/η όσο δεν έχετε νοιώσει ποτέ.*

Ημέρες και ώρες

Παρακαλώ προσπαθείστε να συμπληρώνετε το ερωτηματολόγιο κάθε μέρα και τις κατάλληλες ώρες. **Η συμπλήρωσή του πρέπει να γίνεται μόνο τις εργάσιμες μέρες. Επίσης, μην συμπεριλαμβάνετε στην συμπλήρωση τις ημέρες που έχετε βραδυνή βάρδια.** Αν δεν το συμπληρώσετε την κατάλληλη ώρα, απλά σημειώστε την ώρα που όντως το συμπληρώσατε. Αν τύχει και δεν το συμπληρώσετε μία μέρα, απλά προχωρήστε στην επόμενη μέρα, και συμπληρώστε την προηγούμενη μέρα από μνήμης (αλλά σημειώστε την ημερομηνία και την ώρα που το συμπληρώσατε).

Ευχαριστούμε πολύ για την συνεργασία.

Αλεξάνδρα Παπαγγέλη **Καθηγητής GRJ Hockey**

Παρακαλώ γυρίστε στην τελευταία σελίδα για τις λεπτομέρειες του τί απαιτείται στα τρία τμήματα του ερωτηματολογίου.

Το ερωτηματολόγιο χωρίζεται σε δύο μέρη.
Παρακαλώ προσπαθείστε να τα συμπληρώνετε τις κατάλληλες ώρες

ΜΕΡΟΣ 1

Παρακαλώ συμπληρώστε το ΜΕΡΟΣ 1 στο τέλος της βάρδιας σας.

Σε αυτό το τμήμα σας ρωτάμε ποιές ήταν οι εμπειρίες σας στην δουλειά σας την συγκεκριμένη μέρα. Διαβάστε την κάθε πρόταση και αν αυτή αντανακλά έντονα την εμπειρία της δουλειάς σας την συγκεκριμένη μέρα, σημειώστε έναν μεγάλο αριθμό : το 9 σημαίνει ότι *βιώσατε έντονα την συγκεκριμένη εμπειρία στη δουλειά σας σήμερα* και το 1 σημαίνει ότι *δεν βιώσατε καθόλου την συγκεκριμένη εμπειρία στη δουλειά σας σήμερα.* Παρακαλώ προσπαθείστε να είστε ακριβείς – μας ενδιαφέρει το τί συμβαίνει κάθε μέρα στην δουλειά σας, παρά η δουλειά σας γενικότερα.

ΜΕΡΟΣ 2

Παρακαλώ συμπληρώστε το ΜΕΡΟΣ 2 το βράδυ, πριν πάτε για ύπνο.

2.1 Γενική διάθεση

Η διάθεσή μας αποτελεί μια γενική ένδειξη του πόσο καλά είμαστε γενικότερα. Σας ζητάμε να σημειώσετε πώς νοιώθατε κάθε μέρα, σύμφωνα με όρους που χρησιμοποιούνται για να περιγράψουν διαφορετικές διαθέσεις. Παρακαλώ σημειώστε τον αριθμό που περιγράφει καλύτερα το πώς νοιώθατε την συγκεκριμένη μέρα, για τον κάθε όρο ξεχωριστά.

2.2 Γενικές ενοχλήσεις υγείας

Οι περισσότεροι άνθρωποι νοιώθουν ελαφρά συμπτώματα - πόνους, κούραση κ.λ.π., ακόμη και αν αισθάνονται καλά γενικότερα. Θα θέλαμε να αναφέρετε αν έχετε νοιώσει κάποιο σύμπτωμα από αυτή την τυποποιημένη
λίστα συμπτωμάτων, τις τελευταίες 24 ώρες, σημειώνοντας έναν από τους παρακάτω αριθμούς : [0] = καθόλου, [1] = λίγο, [2] = πολύ.

2.3 Αποτελεσματικότητα

Παρόλο που οι περισσότεροι από εμάς προσπαθούμε να κάνουμε καλά την δουλειά μας, όλοι έχουμε «καλές μέρες» και «κακές μέρες». Μόνο εσείς οι ίδιοι γνωρίζετε πόσο καλά αποδόσατε την συγκεκριμένη ημέρα, ή αν μπορούσατε να τα είχατε πάει καλύτερα. Θα θέλαμε να «εκτιμήσετε» πόσο αποτελεσματικοί είσασταν στην δουλειά σας κάθε ημέρα του ερωτηματολογίου. Το 9 σημαίνει ότι *είσασταν πολύ αποτελεσματικός/ή σήμερα* και το 1 σημαίνει ότι *δεν είσασταν καθόλου αποτελεσματικός/ή σήμερα.*

2.4 Προσπάθεια

Όπως συμβαίνει και με την αποτελεσματικότητα, ποικίλουμε και στο πόση προσπάθεια κάνουμε για να ανταποκριθούμε στις απαιτήσεις της δουλειάς μας. Μερικές φορές προσπαθούμε πολύ σκληρά να κάνουμε τα πάντα και μερικές φορές κάνουμε μόνο τις πιο σπλές δουλειές. Αυτό το τμήμα σας ζητάει να πείτε πόσο πολύ η κάθε πρόταση αντιπροσωπεύει τον τρόπο που προσεγγίζετε την δουλειά σας.

2.5 Φαρμακευτική αγωγή/Θεραπεία

Για να ερμηνεύσουμε τα αποτελέσματα σωστά, χρειάζεται να γνωρίζουμε αν έχετε πάρει κάποιο φάρμακο (π.χ. παυσίπονο, σιρόπι για τον βήχα κ.λ.π.) τις τελευταίες 24 ώρες. Επίσης χρειάζεται να γνωρίζουμε οποιεσδήποτε αλλαγές στην παρούσα κατάσταση της υγείας σας (π.χ. οποιαδήποτε καινούργια θεραπεία ακολουθείτε, αν επισκεφτήκατε τον γιατρό σας κ.λ.π.).

WORK AND WELL-BEING IN NURSING STAFF

Diary

Code _____

Day 1 today's date / /

time starting work _____ **time finishing work** _____

PART 1: (to be completed at the end of the work shift) Completion time _____

Time starting work _____ **Time fininshing work**_____ **Total breaks/free time** _____ hrs-mins

1.1 Work experiences

At work today ...	not at all very much
I had control over my use of time	1 2 3 4 5 6 7 8 9
I had to do jobs that needed a lot of concentration	1 2 3 4 5 6 7 8 9
There were conflicts with colleagues	1 2 3 4 5 6 7 8 9
I got support from my colleagues	1 2 3 4 5 6 7 8 9
I experienced problems with equipment or technical facilities	1 2 3 4 5 6 7 8 9
I had to make some difficult decisions	1 2 3 4 5 6 7 8 9
I worked for a long period of time without a break	1 2 3 4 5 6 7 8 9
I could decide the way in which I did my jobs	1 2 3 4 5 6 7 8 9
I had enough time for breaks	1 2 3 4 5 6 7 8 9
My colleagues gave me a lot of help when I needed it	1 2 3 4 5 6 7 8 9
I had to care a lot for patients or their relatives	1 2 3 4 5 6 7 8 9
I had a lot of heavy work to do – lifting, carrying, etc.	1 2 3 4 5 6 7 8 9
I had to help other people who were upset or unhappy	1 2 3 4 5 6 7 8 9
My actions helped a patient who was very ill	1 2 3 4 5 6 7 8 9
There was a lot of administrative work to do	1 2 3 4 5 6 7 8 9
I had to work quickly for much of the time	1 2 3 4 5 6 7 8 9
The work made a lot of physical demands on me	1 2 3 4 5 6 7 8 9
I could decide what I did next or when to change what I was doing	1 2 3 4 5 6 7 8 9

Please turn over

PART 2: (to be completed in the evening) Time of completing PART 2 _____

2.1 General Mood

How have you felt today?

I have felt . . .	not at all								very much
annoyed	1	2	3	4	5	6	7	8	9
calm	1	2	3	4	5	6	7	8	9
cheerful	1	2	3	4	5	6	7	8	9
depressed	1	2	3	4	5	6	7	8	9
energetic	1	2	3	4	5	6	7	8	9
enthusiastic	1	2	3	4	5	6	7	8	9
irritated	1	2	3	4	5	6	7	8	9
lively	1	2	3	4	5	6	7	8	9
miserable	1	2	3	4	5	6	7	8	9
relaxed	1	2	3	4	5	6	7	8	9
tense	1	2	3	4	5	6	7	8	9
tired	1	2	3	4	5	6	7	8	9
uneasy	1	2	3	4	5	6	7	8	9
worn out	1	2	3	4	5	6	7	8	9

2.2 General Health Complaints

Have you experienced any of the following (however slight) over the past 24 hours?
[0 = not at all; 1 = a little; 2 = a lot]

backache	0 1 2	lack of vitality	0 1 2
chest twinges	0 1 2	light-headedness	0 1 2
cold/flu symptoms	0 1 2	menstrual bleeding	0 1 2
drowsiness	0 1 2	menstrual pain	0 1 2
eyestrain	0 1 2	muscular aches	0 1 2
feeling weak	0 1 2	poor appetite	0 1 2
headaches	0 1 2	upset stomach	0 1 2
problems of attention or concentration			0 1 2
difficulties with decision making or planning			0 1 2
forgetfulness and slips of mind			0 1 2

2.3 Personal Effectiveness

*How generally effective have you have been **today** in getting your work done)*

At work today, I was ...										
not at all effective	1	2	3	4	5	6	7	8	9	very effective

2.4 Job Effort

*How have you reacted **today** in dealing with problems that made work difficult ?*

When problems occurred . . .	not at all								very often
I tried to do everything that was asked from me	1	2	3	4	5	6	7	8	9
I concentrated on doing the simpler tasks	1	2	3	4	5	6	7	8	9
I made a big effort to continue working effectively all day	1	2	3	4	5	6	7	8	9
I left some of the more demanding jobs for later	1	2	3	4	5	6	7	8	9
I worked harder to overcome the problems at work	1	2	3	4	5	6	7	8	9
I tried not to ask too much from myself	1	2	3	4	5	6	7	8	9

2.5 Illness/Medication/Treatment

*Please tell us if you are off work through illness, whether you have taken any drugs (pain-killers, etc) over the past 24 hours, any **new** courses of medical treatment or prescriptions (what, how long, etc), visits to your GP, etc.? (indicate briefly)*

_____

Any further comments:

NOTES FOR COMPLETING THE DIARY

PLEASE READ THESE NOTES CAREFULLY

General information

Please read these notes before you start the diary, and refer to them whenever you are not sure what is meant by an item. The diary is designed to cover a wide range of work activities and experiences, but also to take only a few minutes each day to complete. In order to reduce ambiguity, please try to get a feel for what each of our 'shorthand labels' refers to. Also, please take care when making your response. Try to use the *whole range* (1-9 for most sections; 0-2 for **2.2**) to reflect the range of your experience - and be as accurate as you can. With subjective experiences there are, of course, no absolute highs and lows - the labels refer only to your own range of experience. So in section **2.1**, if you feel very tired (*for you*), circle a high number (say, 7 or 8); if you feel hardly tired at all, circle a number such as 1 or 2. In this scale, as an example of the 1-9 scales, 1 means *not at all tired*; 9 means *as tired as you have ever felt in you life*;

Days and times

Please try to complete the diary on each day, and at the approximate time indicated. Otherwise, indicate the time you actually did it. If you do happen to miss a day, don't worry - just carry on the next day, and complete the previous day from memory (but put in the date and time you did it).

Thank you for your cooperation.

Αλεξάνδρα Παπαγγέλη **Καθηγητής GRJ Hockey**

Please see back cover for details of what is required for the three sections

The diary is in two parts.
Please try to complete these at the appropriate times

PART 1

Please complete PART 1 at the end of the work shift

This asks what your experiences were of work that day. Read each item and, if it is very true of your work on that day, circle a high number: 9 means *my work was very much like this today*; 1 means *my work was not at all like this today.* Please try to be accurate – we are interested in what happened on each day, rather than your job in general.

PART 2

Please complete PART 2 in the evening, before going to bed

2.1 General Mood

Moods are a general indicator of different states of well-being. You are asked to indicate how you have felt on each day, in terms of adjectives used to describe different kinds of moods. Please circle the number that best describes how you have felt today for each of the mood terms.

2.2 General Health Complaints

Most people experience minor symptoms - aches and pains, weariness, and so on, even though they may generally feel well. We would like you to say whether you have experienced any of this standard list of complaints over the past 24 hours, by circling one of the numbers: [0] = not at all; [1] = a little; [2] = a lot.

2.3 Personal Effectiveness

Although most of us try to do our jobs well we all have good days and bad days. Only you can tell if you have performed very well today, or if you could have done better. We would like you to assess how effective you have been in your work on each day of the diary: 9 *means "I was very effective today"*; 1 means "*I was not at all effective today*".

2.4 Job Effort

As with effectiveness, we vary in how much of an effort we make to meet all the demands thrown at us by the job. Sometimes we try very hard to do everything; sometimes just the simpler jobs. This section asks you to say how much each of the statements applies to the way you approaches your work.

2.5 Medication/Treatment

To interpret the results adequately we need to know if you have taken any drugs or medicines during the past 24 hours (including pain-killers, cough medicine, etc) over the past 24 hours? We also need to know any changes in your current medical status (eg. new courses of treatment or prescriptions, visits to your GP, etc).

ΕΡΓΑΣΙΑ ΚΑΙ ΥΓΕΙΑ ΤΟΥ ΝΟΣΗΛΕΥΤΙΚΟΥ ΠΡΟΣΩΠΙΚΟΥ

Ερωτηματολόγιο

Κωδικός _____

1η Ημέρα Ημερομηνία / /

ΜΕΡΟΣ 1: (να συμπληρωθεί στο τέλος της βάρδιας)

Ώρα συμπλήρωσης_____

Ώρα που αρχίζετε την δουλειά σας_____ **Ώρα που τελειώνετε την δουλειά σας_____**

Συνολικός χρόνος διαλειμμάτων_____ **ώρες/λεπτά**

1.1 Εργασιακές εμπειρίες

Στην δουλειά σήμερα ...	καθόλου							πάρα πολύ	
Είχα έλεγχο του πότε και του τί δουλειές θα έκανα	1	2	3	4	5	6	7	8	9
Είχα να κάνω δουλειές που χρειαζόντουσαν μεγάλη αυτοσυγκέντρωση	1	2	3	4	5	6	7	8	9
Είχα να ασχοληθώ με τα προσωπικά μου προβλήματα	1	2	3	4	5	6	7	8	9
Είχα υποστήριξη από τους συναδέλφους μου	1	2	3	4	5	6	7	8	9
Αντιμετώπισα προβλήματα με τα μηχανήματα και τεχνικές υπηρεσίες	1	2	3	4	5	6	7	8	9
Είχα να πάρω κάποιες δύσκολες αποφάσεις	1	2	3	4	5	6	7	8	9
Ήμουν πολύ απασχολημένος όλη την ημέρα	1	2	3	4	5	6	7	8	9
Μπορούσα να αποφασίσω για το πώς να κάνω τις δουλειές που είχα	1	2	3	4	5	6	7	8	9
Μπορούσα να κάνω διάλειμμα όποτε το χρειαζόμουν	1	2	3	4	5	6	7	8	9
Οι συνάδελφοί μου με βοήθησαν πολύ όταν χρειάστηκα βοήθεια	1	2	3	4	5	6	7	8	9
Χρειάστηκε να φροντίσω ασθενείς και τους συγγενείς τους	1	2	3	4	5	6	7	8	9
Είχα πολλές βαριές δουλειές να κάνω-κουβάλημα, μεταφορές κ.λ.π.	1	2	3	4	5	6	7	8	9
Έπρεπε να βοηθήσω άλλους ανθρώπους που ήταν αναστατωμένοι	1	2	3	4	5	6	7	8	9
Οι ενέργειες μου βοήθησαν έναν ασθενή που ήταν πολύ άρρωστος	1	2	3	4	5	6	7	8	9
Είχα να κάνω πολλή διοικητική δουλειά	1	2	3	4	5	6	7	8	9
Έπρεπε να δουλεύω γρήγορα την περισσότερη ώρα	1	2	3	4	5	6	7	8	9
Η δουλειά μου είχε πολλές σωματικές απαιτήσεις	1	2	3	4	5	6	7	8	9
Μπορούσα να αποφασίζω με ποιά σειρά και πότε θα άλλαζα δραστηριότητες	1	2	3	4	5	6	7	8	9

Παρακαλώ γυρίστε σελίδα

ΜΕΡΟΣ 2: (να συμπληρωθεί το βράδυ)

Ώρα συμπλήρωσης _____

2.1 Γενική διάθεση

Πώς νοιώσατε σήμερα ;

Ένοιωσα . . .	καθόλου							πάρα πολύ
ενοχλημένος	1	2	3	4	5	6	7	8 9
ήρεμος	1	2	3	4	5	6	7	8 9
χαρούμενος	1	2	3	4	5	6	7	8 9
θλιμμένος	1	2	3	4	5	6	7	8 9
ενεργητικός	1	2	3	4	5	6	7	8 9
ενθουσιασμένος	1	2	3	4	5	6	7	8 9
εκνευρισμένος	1	2	3	4	5	6	7	8 9
γεμάτος ζωντάνια	1	2	3	4	5	6	7	8 9
δυστυχισμένος	1	2	3	4	5	6	7	8 9
χαλαρωμένος	1	2	3	4	5	6	7	8 9
σε υπερένταση	1	2	3	4	5	6	7	8 9
κουρασμένος	1	2	3	4	5	6	7	8 9
ανήσυχος	1	2	3	4	5	6	7	8 9
εξαντλημένος	1	2	3	4	5	6	7	8 9

2.2 Γενικές ενοχλήσεις υγείας

Νοιώσατε κάποιο από τα παρακάτω συμπτώματα (έστω και ελάχιστα) τις τελευταίες 24 ώρες;
[0 = καθόλου; 1 = λίγο; 2 = πολύ]

πόνο στη μέση	0 1 2	αδυναμία	0 1 2
σουβλιές στο στήθος	0 1 2	ζαλάδα	0 1 2
συμπτώματα κρυολογήματος	0 1 2	πονοκεφάλους	0 1 2
ανακατεμένο στομάχι	0 1 2	είχατε περίοδο	0 1 2
κούραση στα μάτια	0 1 2	πόνους περιόδου	0 1 2
έλλειψη ζωτικότητας	0 1 2	μειωμένη όρεξη	0 1 2
μυικούς πόνους	0 1 2	υπνηλία	0 1 2
προβλήματα στο να συγκεντρωθείτε			0 1 2
δυσκολίες στην λήψη αποφάσεων/ προγραμματισμό			0 1 2
ξεχνούσατε να κάνετε πράγματα			0 1 2

2.3 Αποτελεσματικότητα

Πόσο αποτελεσματικός/ή υπήρξατε σήμερα (στο να κάνετε την δουλειά σας)

Στην δουλειά σήμερα, ήμουν.....		
καθόλου αποτελεσματικός	1 2 3 4 5 6 7 8 9	πολύ αποτελεσματικός

2.4 Προσπάθεια

*Πώς αντιδράσατε **σήμερα** όταν αντιμετωπίσατε προβλήματα που έκανα την δουλειά σας δύσκολη;*

	καθόλου		*πολύ συχνά*	
Προσπάθησα να μην ξεπεράσω τα όριά μου όταν δούλευα	1	2	3	4
Δούλεψα σκληρά για να ξεπεράσω τα προβλήματα που υπήρχαν	1	2	3	4
Κατέβαλα μεγάλη προσπάθεια για να συνεχίζω να δουλεύω αποτελεσματικά	1	2	3	4
Συγκεντρώθηκα στο να κάνω τις δουλειές που ήταν πιο απλές, όπου ήταν δυνατό	1	2	3	4
Δούλεψα πιο σκληρά για να καταφέρω να τελειώσω τις δουλειές μου	1	2	3	4
Άφησα μερικές από τις πιο απαιτητικές δουλειές για αργότερα	1	2	3	4

2.5 Αρρώστειες/Φαρμακευτική αγωγή/Θεραπεία

Παρακαλώ πείτε μας αν είστε εκτός δουλειάς όταν είστε άρρωστοι, αν έχετε πάρει κάποιο φάρμακο (παυσίπονο κ.λ.π.) τις τελευταίες 24 ώρες. Επίσης αναφέρετε με συντομία οποιαδήποτε καινούργια φαρμακευτική θεραπεία ακολουθείτε (ποιά και για πόσο χρονικό διάστημα) και αν επισκεφτήκατε τον γιατρό σας.

_____

Συμπληρωματικά σχόλια:

ΣΗΜΕΙΩΣΕΙΣ ΓΙΑ ΤΗΝ ΣΥΜΠΛΗΡΩΣΗ ΤΟΥ ΕΡΩΤΗΜΑΤΟΛΟΓΙΟΥ

ΠΑΡΑΚΑΛΩ ΔΙΑΒΑΣΤΕ ΠΡΟΣΕΚΤΙΚΑ ΤΙΣ ΠΑΡΑΚΑΤΩ ΣΗΜΕΙΩΣΕΙΣ

Γενικές πληροφορίες

Παρακαλώ διαβάστε τις παρακάτω σημειώσεις πριν αρχίσετε την συμπλήρωση του ερωτηματολογίου και ανατρέξτε σε αυτές όποτε δεν είστε σίγουροι για το τί σημαίνει μια ερώτηση. Το ερωτηματολόγιο είναι φτιαγμένο έτσι ώστε να καλύπτει ένα ευρύ πεδίο δραστηριοτήτων και εμπειριών. Ταυτόχρονα είναι φτιαγμένο έτσι ώστε να χρειάζονται ελάχιστα λεπτά καθημερινά για την συμπλήρωσή του. Για να μειωθούν τυχόν ασάφειες παρακαλώ προσπαθείστε να πάρετε μια γενική ιδέα του σε τί αναφέρεται καθεμιά από τις παρακάτω έννοιες. Επίσης, προσέξτε όταν δίνετε την απάντησή σας. Προσπαθείστε να χρησιμοποιείτε *όλο το σύνολο των αριθμών* (1-9 για τα περισσότερα τμήματα του ερωτηματολογίου, 0-2 για το τμήμα **2.2**), έτσι ώστε να αντανακλάται η ποικιλία των εμπειριών της εργασίας σας. Επίσης, προσπαθείστε να είστε όσο πιο ακριβείς γίνεται. Όσον αφορά τις υποκειμενικές εμπειρίες, φυσικά, δεν υπάρχουν σαφή όρια – οι έννοιες αναφέρονται μόνο στην δική σας ευρύτητα εμπειριών. Άρα στο τμήμα **2.1** του ερωτηματολογίου, αν αισθάνεστε πολύ κουρασμένος, σημειώστε έναν μεγάλο αριθμό (π.χ. 7 ή 8), αν δεν αισθάνεστε σχεδόν καθόλου κουρασμένος σημειώστε έναν μικρό αριθμό (π.χ. το 1 ή 2). Σ'αυτήν την κλίμακα, ως παράδειγμα των κλιμάκων που κυμαίνονται από 1 έως 9, ο αριθμός 1 σημαίνει *ότι δεν αισθάνεστε καθόλου κουρασμένος/η* και ο αριθμός 9 σημαίνει ότι *αισθάνεστε τόσο κουρασμένος/η όσο δεν έχετε νοιώσει ποτέ.*

Ημέρες και ώρες

Παρακαλώ προσπαθείστε να συμπληρώνετε το ερωτηματολόγιο κάθε μέρα και τις κατάλληλες ώρες. **Η συμπλήρωσή του πρέπει να γίνεται μόνο τις εργάσιμες μέρες. Επίσης, μην συμπεριλαμβάνετε στην συμπλήρωση τις ημέρες που έχετε βραδυνή βάρδια.** Αν δεν το συμπληρώσετε την κατάλληλη ώρα, απλά σημειώστε την ώρα που όντως το συμπληρώσατε. Αν τύχει και δεν το συμπληρώσετε μία μέρα, απλά προχωρήστε στην επόμενη μέρα, και συμπληρώστε την προηγούμενη μέρα από μνήμης (αλλά σημειώστε την ημερομηνία και την ώρα που το συμπληρώσατε).

Ευχαριστούμε πολύ για την συνεργασία.

Αλεξάνδρα Παπαγγέλη **Καθηγητής GRJ Hockey**

Παρακαλώ γυρίστε στην τελευταία σελίδα για τις λεπτομέρειες του τί απαιτείται στα τρία τμήματα του ερωτηματολογίου.

Το ερωτηματολόγιο χωρίζεται σε δύο μέρη.
Παρακαλώ προσπαθείστε να τα συμπληρώνετε τις κατάλληλες ώρες

ΜΕΡΟΣ 1

Παρακαλώ συμπληρώστε το ΜΕΡΟΣ 1 στο τέλος της βάρδιας σας.

Σε αυτό το τμήμα σας ρωτάμε ποιές ήταν οι εμπειρίες σας στην δουλειά σας την συγκεκριμένη μέρα. Διαβάστε την κάθε πρόταση και αν αυτή αντανακλά έντονα την εμπειρία της δουλειάς σας την συγκεκριμένη μέρα, σημειώστε έναν μεγάλο αριθμό : το 9 σημαίνει ότι *βιώσατε έντονα την συγκεκριμένη εμπειρία στη δουλειά σας σήμερα* και το 1 σημαίνει ότι *δεν βιώσατε καθόλου την συγκεκριμένη εμπειρία στη δουλειά σας σήμερα*. Παρακαλώ προσπαθείστε να είστε ακριβείς – μας ενδιαφέρει το τί συμβαίνει κάθε μέρα στην δουλειά σας, παρά η δουλειά σας γενικότερα.

ΜΕΡΟΣ 2

Παρακαλώ συμπληρώστε το ΜΕΡΟΣ 2 το βράδυ, πριν πάτε για ύπνο.

2.1 Γενική διάθεση

Η διάθεσή μας αποτελεί μια γενική ένδειξη του πόσο καλά είμαστε γενικότερα. Σας ζητάμε να σημειώσετε πώς νοιώθατε κάθε μέρα, σύμφωνα με όρους που χρησιμοποιούνται για να περιγράψουν διαφορετικές διαθέσεις. Παρακαλώ σημειώστε τον αριθμό που περιγράφει καλύτερα το πώς νοιώθατε την συγκεκριμένη μέρα, για τον κάθε όρο ξεχωριστά.

2.2 Γενικές ενοχλήσεις υγείας

Οι περισσότεροι άνθρωποι νοιώθουν ελαφρά συμπτώματα - πόνους, κούραση κ.λ.π., ακόμη και αν αισθάνονται καλά γενικότερα. Θα θέλαμε να αναφέρετε αν έχετε νοιώσει κάποιο σύμπτωμα από αυτή την τυποποιημένη
λίστα συμπτωμάτων, τις τελευταίες 24 ώρες, σημειώνοντας έναν από τους παρακάτω αριθμούς : [0] = καθόλου, [1] = λίγο, [2] = πολύ.

2.3 Αποτελεσματικότητα

Παρόλο που οι περισσότεροι από εμάς προσπαθούμε να κάνουμε καλά την δουλειά μας, όλοι έχουμε «καλές μέρες» και «κακές μέρες». Μόνο εσείς οι ίδιοι γνωρίζετε πόσο καλά αποδόσατε την συγκεκριμένη ημέρα, ή αν μπορούσατε να τα είχατε πάει καλύτερα. Θα θέλαμε να «εκτιμήσετε» πόσο αποτελεσματικοί είσασταν στην δουλειά σας κάθε ημέρα του ερωτηματολογίου. Το 9 σημαίνει ότι *είσασταν πολύ αποτελεσματικός/ή σήμερα* και το 1 σημαίνει ότι *δεν είσασταν καθόλου αποτελεσματικός/ή σήμερα*.

2.4 Προσπάθεια

Όπως συμβαίνει και με την αποτελεσματικότητα, ποικίλουμε και στο πόση προσπάθεια κάνουμε για να ανταποκριθούμε στις απαιτήσεις της δουλειάς μας. Μερικές φορές προσπαθούμε πολύ σκληρά να κάνουμε τα πάντα και μερικές φορές κάνουμε μόνο τις πιο σπλές δουλειές. Αυτό το τμήμα σας ζητάει να πείτε πόσο πολύ η κάθε πρόταση αντιπροσωπεύει τον τρόπο που προσεγγίζετε την δουλειά σας.

2.5 Φαρμακευτική αγωγή/Θεραπεία

Για να ερμηνεύσουμε τα αποτελέσματα σωστά, χρειάζεται να γνωρίζουμε αν έχετε πάρει κάποιο φάρμακο (π.χ. παυσίπονο, σιρόπι για τον βήχα κ.λ.π.) τις τελευταίες 24 ώρες. Επίσης χρειάζεται να γνωρίζουμε οποιεσδήποτε αλλαγές στην παρούσα κατάσταση της υγείας σας (π.χ. οποιαδήποτε καινούργια θεραπεία ακολουθείτε, αν επισκεφτήκατε τον γιατρό σας κ.λ.π.).

WORK AND WELL-BEING IN NURSING STAFF

Diary

Code _____

Day 1 today's date / /

time starting work _____ **time finishing work** _____

PART 1: (to be completed at the end of the work shift) Completion time _____

Time starting work _____ **Time fininshing work**_____ **Total breaks/free time** _____ hrs-mins

1.1 Work experiences

At work today ...	not at all very much
I had control over my use of time	1 2 3 4 5 6 7 8 9
I had to do jobs that needed a lot of concentration	1 2 3 4 5 6 7 8 9
I had to deal with my own personal problems	1 2 3 4 5 6 7 8 9
I got support from my colleagues	1 2 3 4 5 6 7 8 9
I experienced problems with equipment or technical facilities	1 2 3 4 5 6 7 8 9
I had to make some difficult decisions	1 2 3 4 5 6 7 8 9
I was very busy all day	1 2 3 4 5 6 7 8 9
I could decide the way in which I did my jobs	1 2 3 4 5 6 7 8 9
I could take a break whenever I needed to	1 2 3 4 5 6 7 8 9
My colleagues gave me a lot of help when I needed it	1 2 3 4 5 6 7 8 9
I had to care a lot for patients or their relatives	1 2 3 4 5 6 7 8 9
I had a lot of heavy work to do – lifting, carrying, etc.	1 2 3 4 5 6 7 8 9
I had to help other people who were upset or unhappy	1 2 3 4 5 6 7 8 9
My actions helped a patient who was very ill	1 2 3 4 5 6 7 8 9
There was a lot of administrative work to do	1 2 3 4 5 6 7 8 9
I had to work quickly for much of the time	1 2 3 4 5 6 7 8 9
The work made a lot of physical demands on me	1 2 3 4 5 6 7 8 9
I could decide what I did next or when to change what I was doing	1 2 3 4 5 6 7 8 9

Please turn over

PART 2: (to be completed in the evening) Time of completing PART 2 _____

2.1 General Mood

How have you felt today?

I have felt . . .	not at all								very much
annoyed	1	2	3	4	5	6	7	8	9
calm	1	2	3	4	5	6	7	8	9
cheerful	1	2	3	4	5	6	7	8	9
depressed	1	2	3	4	5	6	7	8	9
energetic	1	2	3	4	5	6	7	8	9
enthusiastic	1	2	3	4	5	6	7	8	9
irritated	1	2	3	4	5	6	7	8	9
lively	1	2	3	4	5	6	7	8	9
miserable	1	2	3	4	5	6	7	8	9
relaxed	1	2	3	4	5	6	7	8	9
tense	1	2	3	4	5	6	7	8	9
tired	1	2	3	4	5	6	7	8	9
uneasy	1	2	3	4	5	6	7	8	9
worn out	1	2	3	4	5	6	7	8	9

2.2 General Health Complaints

Have you experienced any of the following (however slight) over the past 24 hours?
[0 = not at all; 1 = a little; 2 = a lot]

backache	0 1 2	lack of vitality	0 1 2
chest twinges	0 1 2	light-headedness	0 1 2
cold/flu symptoms	0 1 2	menstrual bleeding	0 1 2
drowsiness	0 1 2	menstrual pain	0 1 2
eyestrain	0 1 2	muscular aches	0 1 2
feeling weak	0 1 2	poor appetite	0 1 2
headaches	0 1 2	upset stomach	0 1 2
problems of attention or concentration			0 1 2
difficulties with decision making or planning			0 1 2
forgetfulness and slips of mind			0 1 2

2.3 Personal Effectiveness

*How generally effective have you have been **today** in getting your work done)*

At work today, I was ...		
not at all effective	1 2 3 4 5 6 7 8 9	very effective

2.4 Job Effort

*How have you reacted **today** in dealing with problems that made work difficult ?*

When problems occurred . . .	not at all			very often
I tried not to go beyond my limits while working	1	2	3	4
I worked hard to overcome the problems	1	2	3	4
I made a big effort to continue working effectively	1	2	3	4
I concentrated on doing the simpler tasks, where possible	1	2	3	4
I worked harder to make sure that my jobs were completed	1	2	3	4
I left some of the more demanding jobs for later	1	2	3	4

2.5 Illness/Medication/Treatment

*Please tell us if you are off work through illness, whether you have taken any drugs (pain-killers, etc) over the past 24 hours, any **new** courses of medical treatment or prescriptions (what, how long, etc), visits to your GP, etc.? (indicate briefly)*

_____

Any further comments:

NOTES FOR COMPLETING THE DIARY

PLEASE READ THESE NOTES CAREFULLY

General information

Please read these notes before you start the diary, and refer to them whenever you are not sure what is meant by an item. The diary is designed to cover a wide range of work activities and experiences, but also to take only a few minutes each day to complete. In order to reduce ambiguity, please try to get a feel for what each of our 'shorthand labels' refers to. Also, please take care when making your response. Try to use the *whole range* (1-9 for most sections; 0-2 for **2.2**) to reflect the range of your experience - and be as accurate as you can. With subjective experiences there are, of course, no absolute highs and lows - the labels refer only to your own range of experience. So in section **2.1**, if you feel very tired (*for you*), circle a high number (say, 7 or 8); if you feel hardly tired at all, circle a number such as 1 or 2. In this scale, as an example of the 1-9 scales, 1 means *not at all tired*; 9 means *as tired as you have ever felt in you life*;

Days and times

Please try to complete the diary on each day, and at the approximate time indicated. Otherwise, indicate the time you actually did it. If you do happen to miss a day, don't worry - just carry on the next day, and complete the previous day from memory (but put in the date and time you did it).

Thank you for your cooperation.

Αλεξάνδρα Παπαγγέλη **Καθηγητής GRJ Hockey**

Please see back cover for details of what is required for the three sections

The diary is in two parts.
Please try to complete these at the appropriate times

PART 1
Please complete PART 1 at the end of the work shift

This asks what your experiences were of work that day. Read each item and, if it is very true of your work on that day, circle a high number: 9 means *my work was very much like this today*; 1 means *my work was not at all like this today.* Please try to be accurate – we are interested in what happened on each day, rather than your job in general.

PART 2
Please complete PART 2 in the evening, before going to bed

2.1 General Mood
Moods are a general indicator of different states of well-being. You are asked to indicate how you have felt on each day, in terms of adjectives used to describe different kinds of moods. Please circle the number that best describes how you have felt today for each of the mood terms.

2.2 General Health Complaints
Most people experience minor symptoms - aches and pains, weariness, and so on, even though they may generally feel well. We would like you to say whether you have experienced any of this standard list of complaints over the past 24 hours, by circling one of the numbers: [0] = not at all; [1] = a little; [2] = a lot.

2.3 Personal Effectiveness
Although most of us try to do our jobs well we all have good days and bad days. Only you can tell if you have performed very well today, or if you could have done better. We would like you to assess how effective you have been in your work on each day of the diary: 9 *means "I was very effective today"*; 1 means *"I was not at all effective today"*.

2.4 Job Effort
As with effectiveness, we vary in how much of an effort we make to meet all the demands thrown at us by the job. Sometimes we try very hard to do everything; sometimes just the simpler jobs. This section asks you to say how much each of the statements applies to the way you approaches your work.

2.5 Medication/Treatment
To interpret the results adequately we need to know if you have taken any drugs or medicines during the past 24 hours (including pain-killers, cough medicine, etc) over the past 24 hours? We also need to know any changes in your current medical status (eg. new courses of treatment or prescriptions, visits to your GP, etc).

ΕΡΓΑΣΙΑ ΚΑΙ ΥΓΕΙΑ ΤΟΥ ΝΟΣΗΛΕΥΤΙΚΟΥ ΠΡΟΣΩΠΙΚΟΥ

Πραγματικά θα το εκτιμούσαμε αν αφιερώνατε μερικά λεπτά για να συμπληρώσετε το μικρό αυτό ερωτηματολόγιο. Η εμπιστευτικότητα των απαντήσεων είναι πλήρως εξασφαλισμένη και κανείς δεν θα έχει πρόσβαση στα ερωτηματολόγια πέραν των ενδιαφερομένων ερευνητών.

Ευχαριστούμε πάρα πολύ για την συνεργασία σας.

Αλεξάνδρα Παπαγγέλη

Καθηγητής G R J Hockey
Πανεπιστήμιο του Hull

ΤΜΗΜΑ 1 : Χαρακτηριστικά της καθημερινής σας εργασίας

Παρακαλώ σκεφτείτε προσεκτικά τις παρακάτω ερωτήσεις που αναφέρονται στην καθημερινή σας εργασία και σημειώστε το βαθμό στον οποίο εκφράζουν τον τρόπο που βιώνετε την δουλειά σας. Σημειώστε (με έναν κύκλο) έναν μόνο αριθμό για την κάθε ερώτηση. [1] = καθόλου, [2] = λίγο, [3] = σε μέτριο βαθμό, [4] = αρκετά, [5] = πολύ.

	καθόλου				*πολύ*
1. Η δουλειά σας απαιτεί την αμέριστη προσοχή σας ;	1	2	3	4	5
2. Απαιτεί η δουλειά σας μεγάλη σωματική προσπάθεια ;	1	2	3	4	5
3. Θα μπορούσε η εγρήγορσή σας να συντελέσει στην αποφυγή σοβαρών προβλημάτων για τους ασθενείς;	1	2	3	4	5
4. Μπορείτε να αποφασίζετε οι ίδιοι για το πότε θα κάνετε διάλειμμα κατά την διάρκεια της δουλειάς σας;	1	2	3	4	5
5. Μπορείτε να αποφασίζετε οι ίδιοι για το πότε θα αρχίσετε και πότε θα φύγετε από την δουλειά σας ;	1	2	3	4	5
6. Υπάρχει αρκετή υποστήριξη από τους συναδέλφους σας όταν τα πράγματα πάνε στραβά;	1	2	3	4	5
7. Χρειάζεται να αποφασίζετε εσείς για τον τρόπο με τον οποίο θα αντιμετωπίσετε ένα πρόβλημα ;	1	2	3	4	5
8. Μπορείτε να αποφασίζετε οι ίδιοι για τον τρόπο με τον οποίο θα κάνετε την δουλειά σας ;	1	2	3	4	5
9. Θα μπορούσε μια στιγμή απροσεξίας από μέρους σας να έχει ως αποτέλεσμα σημαντική ζημιά σε μηχανήματα;	1	2	3	4	5
10. Στην δουλειά σας απαιτούνται αποφάσεις στιγμής ;	1	2	3	4	5
11. Χρειάζεται να είστε συγκεντρωμένοι ανά πάσα στιγμή για να ελέγχετε για προβλήματα που μπορεί να προκύψουν ;	1	2	3	4	5
12. Προγραμματίζετε το τί κάνετε όταν βρίσκεστε στην δουλειά σας ;	1	2	3	4	5
13. Ενδιαφέρεστε για το καλό των άλλων ;	1	2	3	4	5
14. Όταν εργάζεστε, χρειάζεται να είστε ενήμεροι για διάφορα πράγματα που συμβαίνουν ταυτόχρονα ;	1	2	3	4	5
15. Μπορείτε να επιλέξετε οι ίδιοι τον τρόπο ή την μέθοδο που θα χρησιμοποιήσετε να εκτελέσετε διαφορετικά κομμάτια της δουλειάς σας ;	1	2	3	4	5
16. Θα μπορούσε ένα λάθος από μέρους σας να έχει επίπτωση στο καλό του ασθενή;	1	2	3	4	5
17. Έχετε αρκετή βοήθεια στην δουλειά σας όταν την χρειάζεστε ;	1	2	3	4	5
18. Εξαρτάται το καλό άλλων ατόμων από εσάς ;	1	2	3	4	5
19. Χρειάζεται να αντιδράτε γρήγορα για την αποφυγή προβλημάτων που μπορεί να προκύψουν ;	1	2	3	4	5
20. Αντιμετωπίζετε προβλήματα στην δουλειά σας που δεν έχετε ξανασυναντήσει ;	1	2	3	4	5
21. Η δουλειά σας περιλαμβάνει αρκετό βαρύ κουβάλημα κει μεταφορές ;	1	2	3	4	5
22. Μπορείτε να αλλάξετε τον τρόπο που εκτελείτε τα καθήκοντά σας ;	1	2	3	4	5
23. Χρειάζεται να φροντίζετε ταραγμένους ασθενείς και αναστατωμένους συγγενείς;	1	2	3	4	5
24. Αποφασίζετε οι ίδιοι για το πότε θα ασχοληθείτε με διαφορετικές δραστηριότητες;	1	2	3	4	5
25. Η δουλειά σας απαιτεί να βρίσκετε λύσεις σε προβλήματα για τα οποία δεν υπάρχει προφανής απάντηση ;	1	2	3	4	5
26. Αποτελεί μέρος της δουλειάς σας το να ακούτε τα προβλήματα άλλων ανθρώπων;	1	2	3	4	5
27. Η δουλειά σας απαιτεί μεγάλη διανοητική προσπάθεια από μέρους σας;	1	2	3	4	5
28. Απαιτεί η δουλειά σας να είστε αρκετό καιρό σε ορθοστασία ή σε κίνηση;	1	2	3	4	5
29. Υπάρχει πιθανότητα να υπάρξουν σοβαρές συνέπειες αν κάνετε κάποιο λάθος στη δουλειά σας ;	1	2	3	4	5
30. Μπορείτε να αποφασίσετε την σειρά με την οποία θα κάνετε διαφορετικές δραστηριότητες της δουλειάς σας ;	1	2	3	4	5
31. Τα προβλήματα με τα οποία ασχολείστε απαιτούν τεχνικές γνώσεις και δεξιότητες	1	2	3	4	5
32. Απαιτεί η δουλειά σας να δουλεύετε γρήγορα;	1	2	3	4	5
33. Ασχολείστε με τα προβλήματα άλλων ατόμων στην δουλειά σας;	1	2	3	4	5

ΤΜΗΜΑ 2. Εργασία και τα συναισθήματά σας

Σε ποιό βαθμό νοιώθετε καθένα από τα παρακάτω όταν είστε στην δουλειά σας ; Παρακαλώ σημειώστε έναν μόνο αριθμό για το καθένα από τα παρακάτω. Οι μεγαλύτεροι αριθμοί σημαίνουν ότι αισθάνεστε έτσι συχνότερα: [π.χ. 1 = " δεν αισθάνομαι ποτέ έτσι", 5 = " αισθάνομαι έτσι περίπου τον μισό καιρό", 9 = " πάντα αισθάνομαι έτσι"].

ενοχλημένος	1 2 3 4 5 6 7 8 9	γεμάτος ζωντάνια	1 2 3 4 5 6 7 8 9
ήρεμος	1 2 3 4 5 6 7 8 9	δυστυχισμένος	1 2 3 4 5 6 7 8 9
χαρούμενος	1 2 3 4 5 6 7 8 9	χαλαρωμένος	1 2 3 4 5 6 7 8 9
θλιμμένος	1 2 3 4 5 6 7 8 9	σε υπερένταση	1 2 3 4 5 6 7 8 9
ενεργητικός	1 2 3 4 5 6 7 8 9	κουρασμένος	1 2 3 4 5 6 7 8 9
ενθουσιασμένος	1 2 3 4 5 6 7 8 9	ανήσυχος	1 2 3 4 5 6 7 8 9
εκνευρισμένος	1 2 3 4 5 6 7 8 9	εξαντλημένος	1 2 3 4 5 6 7 8 9

ΤΜΗΜΑ 3 : Επαγγελματική ικανοποίηση

Πόσο ικανοποιημένος ή δυσαρεστημένος είστε με το καθένα από τα παρακάτω στοιχεία της εργασίας σας; Παρακαλώ σημειώστε έναν από τους παρακάτω αριθμούς για την κάθε ερώτηση : [1] = πάρα πολύ δυσαρεστημένος, [2] = πολύ δυσαρεστημένος, [3] = σχετικά δυσαρεστημένος, [4] = δεν είμαι σίγουρος, [5] = σχετικά ικανοποιημένος, [6] = πολύ ικανοποιημένος, [7] = πάρα πολύ ικανοποιημένος.

Πόσο ικανοποιημένος/η είστε με....	***πάρα πολύ δυσαρεστημένος***						***πάρα πολύ ικανοποιημένος***
1. τις φυσικές συνθήκες εργασίας σας ;	1	2	3	4	5	6	7
2. την ελευθερία που σας δίνεται στο να διαλέγετε την μέθοδο της δουλειάς σας ;	1	2	3	4	5	6	7
3. τους συναδέλφους σας ;	1	2	3	4	5	6	7
4. την αναγνώριση που έχετε όταν κάνετε καλή δουλειά ;	1	2	3	4	5	6	7
5. τον άμεσο προϊστάμενό σας ;	1	2	3	4	5	6	7
6. την υπευθυνότητα που σας δίνουν ;	1	2	3	4	5	6	7
7. την αμοιβή σας ;	1	2	3	4	5	6	7
8. την δυνατότητα να χρησιμοποιείτε τις ικανότητές σας ;	1	2	3	4	5	6	7
9. τις σχέσεις μεταξύ προϊσταμένων και υφισταμένων ;	1	2	3	4	5	6	7
10. την δυνατότητα προαγωγής ;	1	2	3	4	5	6	7
11. τον τρόπο που διοικείται το Νοσοκομείο ;	1	2	3	4	5	6	7
12. την προσοχή που δίνεται σε προτάσεις που κάνετε ;	1	2	3	4	5	6	7
13. το εργασιακό σας ωράριο ;	1	2	3	4	5	6	7
14. την ποικιλία που υπάρχει στην εργασία σας ;	1	2	3	4	5	6	7
15. την μονιμότητα, εξασφάλιση και σιγουριά της δουλειάς σας ;	1	2	3	4	5	6	7

ΤΜΗΜΑ 4 : Μικρές ενοχλήσεις υγείας

Ο καθένας νοιώθει μικρές ενοχλήσεις στην υγεία του. Σε ποιό βαθμό νοιώσατε καθένα από τα παρακάτω (έστω και ελάχιστα) την τελευταία εβδομάδα ; Σημειώστε έναν αριθμό για το καθένα από τα παρακάτω : [0] = καθόλου, [1] = λίγο, [2] = πολύ.

πόνους	0 1 2	πονοκεφάλους	0 1 2
συμπτώματα κρυολογήματος/γρίπης	0 1 2	έλλειψη ζωτικότητας/αδυναμία	0 1 2
κούραση στα μάτια	0 1 2	άσχημο ύπνο	0 1 2
υπνηλία κατά την διάρκεια της μέρας	0 1 2	μειωμένη όρεξη	0 1 2
στενοχωρημένος χωρίς ιδιαίτερο λόγο	0 1 2	ανακατεμένο στομάχι	0 1 2

προβλήματα συγκέντρωσης	0 1 2
δυσκολίες στην λήψη αποφάσεων και προγραμματισμό	0 1 2
ξεχνούσατε να κάνετε πράγματα	0 1 2

ΤΜΗΜΑ 5 : Προσπάθεια

*Πώς αντιδράσατε **τον περασμένο μήνα** όταν αντιμετωπίσατε προβλήματα που έκαναν την δουλειά σας δύσκολη ;*

Όταν υπήρξαν προβλήματα στην δουλειά μου τον περασμένο μήνα . .	καθόλου			πολύ συχνά
1. Προσπάθησα να μην ξεπεράσω τα όριά μου όταν δούλευα	1	2	3	4
2. Δούλεψα πολύ σκληρά για να ξεπεράσω τα προβλήματα που υπήρχαν	1	2	3	4
3. Κατέβαλα μεγάλη προσπάθεια για να συνεχίζω να δουλεύω αποτελεσματικά	1	2	3	4
4. Συγκεντρώθηκα στο να κάνω δουλειές που ήταν πιο απλές, όπου ήταν δυνατό	1	2	3	4
5. Δούλεψα πιο σκληρά για να καταφέρω να τελειώσω τις δουλειές μου	1	2	3	4
6. Άφησα μερικές από τις πιο απαιτητικές δουλειές για αργότερα	1	2	3	4

ΤΜΗΜΑ 6. Η ψυχολογική σας κατάσταση

Πώς νοιώθετε γενικά, είτε βρίσκεστε στην δουλειά σας είτε όχι ; Παρακαλώ σημειώστε για πόσο καιρό τον προηγούμενο μήνα νοιώσατε καθένα από τα παρακάτω. Σημειώστε έναν αριθμό για το καθένα : [1] = καθόλου, [2] = κατά καιρούς, [3] = αρκετά συχνά, [4] = τον περισσότερο καιρό.

Τον προηγούμενο μήνα πόσο πολύ....	*καθόλου*			*πολύ συχνά*
1. μπορούσατε να συγκεντρωθείτε σε αυτό που κάνατε ;	1	2	3	4
2. χάσατε τον ύπνο σας ανησυχώντας για κάτι ;	1	2	3	4
3. νοιώσατε να είστε χρήσιμος σε κάποια πράγματα ;	1	2	3	4
4. νοιώσατε ικανός να αποφασίσετε για πράγματα ;	1	2	3	4
5. νοιώσατε συνέχεια υπό πίεση ;	1	2	3	4
6. νοιώσατε ότι δεν μπορούσατε να ξεπεράσετε τις δυσκολίες που είχατε ;	1	2	3	4
7. μπορούσατε να χαρείτε τις συνηθισμένες καθημερινές σας ασχολίες ;	1	2	3	4
8. μπορούσατε να αντιμετωπίσετε τα προβλήματά σας ;	1	2	3	4
9. νοιώσατε στενοχωρημένος/η ή θλιμένος/η ;	1	2	3	4
10. χάσατε την εμπιστοσύνη στον εαυτό σας ;	1	2	3	4
11. βλέπατε τον εαυτό σας σαν αξιόλογο άτομο;	1	2	3	4
12. νοιώσατε σχετικά χαρούμενος ;	1	2	3	4

(1)Είχατε κάποιο σοβαρό πρόβλημα υγείας τα τελευταία 2 χρόνια ;

(2) Πόσες φορές επισκεφτήκατε τον γιατρό σας τον περασμένο χρόνο ; (σημειώστε ένα από τα παρακάτω)

[0] [1] [2] [3] [4] [5 ή περισσότερες]

Τέλος, παρακαλώ συμπληρώστε τα παρακάτω στοιχεία:

Φύλο *Ηλικία*

Σε ποιό Νοσοκομείο εργάζεστε ;

Σε ποιά κλινική εργάζεστε ; (π.χ. καρδιολογική, παιδιατρική κ.λ.π.)

Οικογενειακή κατάσταση (παρακαλώ σημειώστε ένα από τα παρακάτω) :

Έγγαμος/η [ ] Ελεύθερος /η [ ] Διαζευγμένος/η [ ] Χήρος/α [ ]

Πόσα παιδιά έχετε ; [ ] Τί ηλικίες/φύλο έχουν ; [ ]

Ευχαριστούμε πολύ για την συμμετοχή σας.

WORK AND WELL-BEING IN THE NURSING PROFESSION

We would be very grateful if you could take a few minutes to complete this brief questionnaire. All replies will be treated in absolute confidence. Although you do not need to put your name on the form, it would help us to contact you again if we wished to clarify anything.

Thank you very much for your co-operation.

Alexandra Papangeli *Professor G R J Hockey*
University of Hull

SECTION 1: Characteristics of your day-to-day work

Please consider carefully the following questions about your everyday work, and indicate how much they apply to your own experience of the job. Circle one number for each item: [1]= not at all, [2]= just a little, [3]= a moderate amount, [4]= quite a lot, [5]= a great deal.

	not at all				*a great deal*
1. Does your work need your undivided attention?	1	2	3	4	5
2. Does your work require a lot of effort?	1	2	3	4	5
3. Could alertness on you part help prevent serious problems for patients?	1	2	3	4	5
4. Can you decide when to take a break in normal work periods?	1	2	3	4	5
5. Can you decide when to start work and when to leave?	1	2	3	4	5
6. Is there much support from colleagues when things go wrong?	1	2	3	4	5
7. Do you have to make decisions about how to tackle a problem?	1	2	3	4	5
8. Can you decide for yourself about how to go about getting the job done?	1	2	3	4	5
9. Could a lapse of attention result in costly damage to equipment?	1	2	3	4	5
10. Does your job require you to be able to think on your feet?	1	2	3	4	5
11. Do you have to concentrate all the time to watch for things going wrong?	1	2	3	4	5
12. Do you plan your own work?	1	2	3	4	5
13. Do you have to concern yourself with the welfare of others?	1	2	3	4	5
14 Do you have to keep track of several things going on at the same time?	1	2	3	4	5
15. Can you choose how you will carry out different aspects of your work?	1	2	3	4	5
16. Could an error on your part result in a threat to a patient's welfare?	1	2	3	4	5
17. Do you get much help from colleagues when you need it?	1	2	3	4	5
18. Do other people depend on you for their well-being?	1	2	3	4	5
19. Do you have to react quickly to prevent problems developing?	1	2	3	4	5
20. Do you come across problems at work which you have not met before?	1	2	3	4	5
21. Does your work involve a lot of heavy lifting and carrying?	1	2	3	4	5
22. Can you vary how you do your work?	1	2	3	4	5
23. Do you need to take care of upset patients or relatives?	1	2	3	4	5
24. Do you decide when to carry out different activities?	1	2	3	4	5
25. Are you required to solve problems which have no obvious answer?	1	2	3	4	5
26. Are you expected to listen to other people's problems?	1	2	3	4	5
27. Do you have to put a high level of mental effort into your work?	1	2	3	4	5
28. Does your work require you to be on your feet a lot?	1	2	3	4	5
29. Are there likely to be serious consequences of you making an error at work?	1	2	3	4	5
30. Can you decide the order in which you do different parts of the job?	1	2	3	4	5
31. Do the problems you deal with require technical knowledge and skills?	1	2	3	4	5
32. Do you need to work quickly?	1	2	3	4	5
33. Do you have to deal wit other people's problems at work?	1	2	3	4	5

SECTION 2. Work Feelings

To what extent do you generally feel each of the following when you are at work? Please circle one number for each kind of feeling. High numbers mean that you feel like this more often: [e.g. 1 = " I never feel like this", 5 = " I feel like this about half the time", 9 = " I always feel like this"].

annoyed	1 2 3 4 5 6 7 8 9	full of energy	1 2 3 4 5 6 7 8 9
calm	1 2 3 4 5 6 7 8 9	miserable	1 2 3 4 5 6 7 8 9
happy	1 2 3 4 5 6 7 8 9	relaxed	1 2 3 4 5 6 7 8 9
sad	1 2 3 4 5 6 7 8 9	tense	1 2 3 4 5 6 7 8 9
energetic	1 2 3 4 5 6 7 8 9	tired	1 2 3 4 5 6 7 8 9
enthusiastic	1 2 3 4 5 6 7 8 9	worried	1 2 3 4 5 6 7 8 9
angry	1 2 3 4 5 6 7 8 9	worn out	1 2 3 4 5 6 7 8 9

SECTION 3. Job Satisfaction

How satisfied or dissatisfied are you with each of these general features of your present job? Please circle one of the boxes for each item: [1] = very dissatisfied, [2] = dissatisfied, [3] = fairly dissatisfied, [4] = I am not sure [5] = fairly satisfied, [6] = satisfied, [7] = very satisfied.

How satisfied are you with....	*very dissatisfied*						*very satisfied*
1. the physical work conditions?	1	2	3	4	5	6	7
2. the freedom to choose your own method of working?	1	2	3	4	5	6	7
3. your fellow workers?	1	2	3	4	5	6	7
4. the recognition you get for good work?	1	2	3	4	5	6	7
5. your immediate boss?	1	2	3	4	5	6	7
6. the amount of responsibility you are given?	1	2	3	4	5	6	7
7. your rate of pay?	1	2	3	4	5	6	7
8. the opportunity to use your abilities?	1	2	3	4	5	6	7
9. industrial relations between managers and other workers?	1	2	3	4	5	6	7
10. your chance of promotion?	1	2	3	4	5	6	7
11. the way the hospital is managed?	1	2	3	4	5	6	7
12. the attention paid to suggestions you make?	1	2	3	4	5	6	7
13. your hours of work?	1	2	3	4	5	6	7
14. the amount of variety in your job?	1	2	3	4	5	6	7
15. your job security?	1	2	3	4	5	6	7

TMHMA 4. Minor health complaints

Everyone experiences minor health complaints. How much have you experienced nay of the following (however slight) over the past week or so? Circle one number for each: [0] = not at all, [1] = a little, [2] = a lot.

aches and pains	0 1 2	headaches	0 1 2
cold/flu symptoms	0 1 2	lack of vitality/weakness	0 1 2
eyestrain	0 1 2	not sleeping well	0 1 2
feeling drowsy/sleepy in the daytime	0 1 2	poor appetite	0 1 2
feeling upset for no good reason	0 1 2	upset stomach	0 1 2

problems of attention or concentration	0 1 2
difficulties with decision making or planning	0 1 2
forgetfulness and slips of mind	0 1 2

SECTION 5. Job effort

*How have you reacted **last month** in dealing with problems that made work difficult ?*

*When I experienced problems in my job **last month**.....*	never		very	often
I tried not to go beyond my limits while working	1	2	3	4
I worked very hard in order to overcome problems at work	1	2	3	4
I made a big effort to continue working all day	1	2	3	4
I concentrated on doing simpler jobs	1	2	3	4
I worked very hard in order to overcome problems at work	1	2	3	4
I left some of the most demanding jobs for later	1	2	3	4

SECTION 6. General well-being

How do you fell generally, whether at work or outside work? Please indicate how much of the time over the past month you have felt like each of the following? Circle one number for each: [1] = not at all, [2] = occasionally, [3] = quite often, [4] = most of the time.

Over the past month, how much have you....		*not at all*			*most of the time*
1	been able to concentrate on what you are doing ?	1	2	3	4
2	lost much sleep over worry?	1	2	3	4
3	felt that you are playing a useful part in things?	1	2	3	4
4	felt capable of making decisions about things?	1	2	3	4
5	felt constantly under strain?	1	2	3	4
6	felt you couldn't overcome your difficulties?	1	2	3	4
7	been able to enjoy your normal day-to-day activities?	1	2	3	4
8	been able to face up to your problems?	1	2	3	4
9	been feeling unhappy or depressed?	1	2	3	4
10	been losing confidence in yourself?	1	2	3	4
11	been thinking of yourself as a worthwhile person?	1	2	3	4
12	been feeling reasonably happy, all things considered?	1	2	3	4

(1)Have you experienced any more serious medical health problems over the past 2 years ?

(2) How often have you visited your GP during the past year? (tick one)

[0] *[1]* *[2]* *[3]* *[4]* *[5 ή περισσότερες]*

Finally, please complete the information below:

Sex *Age*

Which hospital do you work in?

Which Ward/ Speciality do you work in?

Maritalstatus (please tick one of the following) :

married [ ] single [ ] divorced [ ] widowed [ ]

how many children do you have? [ ] age/sex of children [ ]

Thank very much for your co-operation.

I. Reliability analysis - Diary

Table 1. Cronbach's α for the diary study variables (Wave 1)

Scale	*No. of items*	α
Emotional demands	4	.70
Mental demands	4	.61
Problem-solving demands	2	.57
Physical demands	2	.69
Control	4	.67
Support	2	.84
Anger	2	.78
Anxiety	4	.72
Fatigue	4	.68
Depression	4	.73
Effort	6	.61

I. Reliability analysis - Diary

Table 1. Cronbach's α for the diary study variables (Wave 2)

Scale	*No. of items*	α
Emotional demands	4	.71
Mental demands	4	.61
Problem-solving demands	2	.54
Physical demands	2	.65
Control	4	.59
Support	2	.80
Anger	2	.74
Anxiety	4	.64
Fatigue	4	.58
Depression	4	.60
Effort	6	.55

II. Reliability analysis - Questionnaire

Table 1. Cronbach's α for the questionnaire variables (Wave 1)

Scale	*No. of items*	α
Emotional demands	5	.60
Mental demands	6	.63
Monitoring demands	4	.69
Responsibility demands	4	.64
Physical demands	3	.68
Time control	3	.61
Method control	5	.71
Support	2	.63
Effort	6	.47
Anger	2	.74
Anxiety	4	.70
Fatigue	4	.62
Depression	4	.64
GHQ	12	.83
Job satisfaction	15	.89

II. Reliability analysis - Questionnaire

Table 1. Cronbach's α for the questionnaire variables (Wave 2)

Scale	*No. of items*	α
Emotional demands	5	.55
Mental demands	6	.51
Monitoring demands	4	.57
Responsibility demands	4	.55
Physical demands	3	.55
Time control	3	.50
Method control	5	.61
Support	2	.46
Effort	6	.41
Anger	2	.85
Anxiety	4	.68
Fatigue	4	.67
Depression	4	.72
GHQ	12	.84
Job satisfaction	15	.89

INDIVIDUAL MEANS – DIARY 2000

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
1	2.68	4.89	2.67	2.8	0.38	7.17
2	2.39	6.14	2.42	5.34	0.7	5.27
3	4.15	4.79	2.86	3.75	0.27	7.83
4	3.9	6.86	2.57	3.81	0.26	7.13
6	4.08	7.56	2.58	2.06	0.03	8
7	4.81	7.01	2.82	3.2	0.12	7.13
9	4.54	4.62	2.50	4.32	0.42	5.38
10	3.59	6.4	2.73	4.21	0.57	6.46
11	5.83	6.35	2.63	5.54	0.73	6.63
12	4.95	5.51	2.62	4.39	0.57	6.04
13	3.82	6.58	2.22	3.15	0.13	6.04
14	3.29	7.38	3.39	4.24	0.24	8.22
16	5.52	6.08	2.83	5.25	0.53	6.71
18	5.03	8.47	2.64	4.86	0.35	7.92
19	3.15	8.39	2.53	2.68	0.07	8.71
20	5.66	5.08	2.83	3.08	0.49	5.54
21	4.2	6.37	2.89	4.87	0.17	7.46
22	4.33	7.46	2.56	3.56	0.25	8.25
23	2.61	6.72	2.72	2.19	0.1	7.33
24	3	7.55	2.52	2.88	0.2	7.75
25	5.8	5.91	2.69	5.06	0.46	7.13
26	4.23	6.12	2.75	3.42	0.36	7.75
27	3.6	6.3	2.55	3.81	0.26	6.7
28	4.73	7.56	2.58	3.52	0.31	7.58
29	5.25	6.07	3.26	4.43	0.23	7.83
30	6.16	6.47	2.54	5.24	0.24	6.87
31	4.56	7.13	3.03	3.21	0.22	7.58
33	5.51	5.2	2.65	3.79	0.83	5.67
34	6.03	6.64	2.92	5.05	0.83	7.26
35	4.89	7.41	2.65	3.36	0.31	7.17

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
38	4.19	6.36	3.51	3.6	0.2	8.33
39	4.25	6.19	2.62	4.07	0.45	4.88
41	5.27	5.73	2.78	3.9	0.23	7.35
42	5.59	6.95	2.53	3.84	0.24	8.13
43	5.13	6.9	2.56	3.31	0.22	7.96
44	5.98	7.82	2.49	3.16	0.31	8.54
46	4.95	6.9	2.65	3.94	0.37	7.09
47	5.3	4.86	2.51	5.86	0.98	5.75
48	5.21	5.42	2.70	5.4	0.67	6.96
50	6.54	6.63	2.64	5.15	1.4	7
51	6.2	6.52	2.80	4.79	0.46	8.29
52	4.63	6.1	2.60	4.02	0.21	7.52
53	5.29	6.05	2.51	5.29	0.48	6.63
54	6.1	6.26	2.65	3.54	0.8	7.42
55	6.49	7.18	2.76	3.68	0.25	7.71
56	5.5	6.91	2.73	3.96	0.45	8.13
57	4.54	4.72	2.69	4.53	0.52	7.92
58	5.31	5.09	2.78	3.77	0.25	7.21
59	5.58	5.81	2.76	4.39	0.75	7.5
60	6.51	3.44	3.25	4.86	0.21	7.92
61	5.45	5.43	2.84	3.88	0.4	7.09
62	4.62	6.07	2.42	4.81	0.21	6.13
63	2.72	7.14	2.51	3.8	0.98	7.26
64	2.79	7.55	2.42	2.39	0.09	8
66	4.52	3.81	2.91	5.05	1.1	6.58
68	5.73	5.76	2.53	4.55	0.68	6.46
69	5.05	5.39	2.56	5.22	0.99	7.33
70	2.95	6.57	2.79	3.48	0.27	5.33
72	5.23	6.64	2.66	3.15	0.23	6.92
73	5.67	5.81	2.52	4.76	0.63	5.96
74	3.26	6.72	2.66	3.69	0.2	6.29

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
75	3.26	6.47	2.49	3.8	0.28	6.17
76	5.2	6.79	2.91	3.41	0.53	6.13
78	5.15	5.1	2.53	5.29	0.9	5.59
79	4.14	7.39	2.60	2.69	0.22	7.67
82	4.31	6.42	2.56	3.51	0.28	6.92
84	4.15	7.46	2.53	3.4	0.26	8.08
87	4.6	8.05	2.50	2.67	0.18	8.04
88	3.23	6.68	3.08	3.68	0.31	7.42
89	4.96	6.41	2.92	3.89	0.73	6.96
93	6.09	7.19	2.57	2.47	0.03	7.67
94	5.77	8.24	2.87	3.98	0.57	8.83
95	5.73	7.31	2.59	4.57	0.42	7.46
96	4.66	7.37	2.52	4.13	0.15	8.21
98	4.84	7.11	2.49	2.66	0.19	7.57
99	5.58	6.81	3.31	4.15	0.37	8
100	4.27	7.39	2.80	3.99	0.27	6.75
102	4.86	6.38	2.88	2.91	0.2	7.82
103	5.2	7	2.82	3.69	0.34	7.63
104	4.21	5.68	2.59	4.17	0.38	7.17
105	6.32	6.9	2.92	3.77	0.38	8.13
109	4.27	6.84	2.42	5.26	0.37	6.33
111	4.09	7.45	2.46	2.94	0.07	7.83
120	5.24	7.59	2.53	2.58	0.13	7.71
121	5.51	7.47	2.57	3.82	0.34	7.04
122	5.43	8.26	2.69	2.61	0.13	8.25
123	4.62	7.02	2.54	2.92	0.12	7.92
124	3.27	6.09	2.45	2.68	0	7.79
125	5.19	5.36	2.70	4.93	0.37	6.5
126	5.15	5.41	2.47	5.02	1.06	6.67
127	5.77	5.46	2.58	4.9	0.13	5.46
128	4.42	6.73	2.83	3.94	0.35	6.42
129	4.74	6.33	3.17	6.07	0.68	7.29

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
130	2.79	6.99	2.19	3.85	0.33	6.08
131	4.62	4.81	2.59	5.26	0.54	5.67
132	4.71	4.37	2.58	4.38	0.16	5.04
133	5.21	5.66	2.72	4.35	0.22	6.36
135	5.25	6.41	2.63	3.9	0.45	6.59
136	5.96	6.4	2.39	4.32	0.04	8.29
137	4.14	7.74	2.12	2.46	0.1	8.13
140	6	7.28	3.07	4.04	0.37	7.83
141	4.44	6.96	2.54	3.04	0.22	7.29
142	4.58	5.37	2.70	3.66	0.26	6.17
143	4.8	5.91	2.44	3.63	0.13	6.58
144	6.48	6.52	2.49	5.23	0.29	6.96
145	6.03	6.03	2.62	5.11	0.62	5.83
146	4.22	7.1	2.63	3.92	0.2	7.17
147	5.23	7.19	2.68	3.45	0.16	7.21
206	3.4	5.48	2.56	2.65	0.01	6.17
207	2.77	6.95	2.58	4.05	0.23	6.42
208	2.77	5.85	3.00	3.72	0.12	8.63
214	2.77	6.21	2.44	3.61	0.11	6.75
215	2.46	2.88	2.82	3.62	0.2	6.75
216	3.72	7.01	2.66	4.13	0.49	7.46
219	3.64	5.51	2.71	4.56	0.56	6.25
220	2.87	6.95	2.55	2.88	0.22	7.79
221	2.99	7.22	2.75	2.6	0.25	8.04
223	5.73	5.5	2.90	4.74	0.2	7.46
224	3.15	7.35	2.44	3.05	0.16	7.5
225	4.12	5.81	2.45	3.05	0.64	6.75
226	3.6	7.11	2.53	2.97	0.28	8.54
227	4.51	4.89	2.64	4.83	0.91	4.83
228	6.06	7.24	2.59	3.63	0.18	6.5
232	3.73	6.67	2.44	3.08	0.01	7.46

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
234	5.3	5.42	3.02	3.54	0.27	7.65
236	3.27	5.05	2.61	3.3	0.34	7.25
237	4.51	4.86	2.63	3.85	0.43	6.48
238	3.68	4.17	2.62	4.25	0.27	7.21
240	4.79	5.98	2.58	5.07	0.39	5.92
241	4.54	5.84	2.76	2.99	0.73	6.29
242	4.63	6.15	2.55	4.64	0.66	5.5
243	3.56	6.01	2.97	2.55	0.2	7.96
245	2.34	5.89	2.74	4.94	0.36	6.29
248	4.45	5.79	2.44	4.22	0.3	4.79
249	4.23	6.6	2.72	3.1	0.07	8.21
250	5.05	5.11	2.51	4.88	0.93	7.58
251	4.61	4.72	2.31	4.64	0.49	0.49
252	5.46	6.42	2.65	4.06	0.55	6.25
258	5.09	5.18	2.67	5	0.35	6.04
259	4.31	6.95	2.66	2.8	0.18	7.92
260	5.7	7.54	2.80	1.57	0.01	7.38
261	5.96	5.89	2.56	4.5	0.33	6.46
262	6.16	6.1	2.47	4.24	0.48	6.88
263	3.8	6.05	2.58	3.3	0.66	6.08
264	4.64	6.28	2.77	3.78	0.41	7.42
266	5.62	7.26	2.70	3.91	0.46	8.33
267	4.91	7.34	2.57	3.1	0.41	6.92
270	3.18	5.39	2.87	4.98	0.65	6.75
271	6.3	7.45	2.62	4.43	0.32	7.61
272	3.8	4.7	2.44	4.09	0.25	6.21
273	4.8	7.02	2.79	3.13	0.38	7.71
274	5.67	6.18	2.57	4.69	0.5	7.5
275	5.02	5.47	2.63	3.19	0.01	6.17
281	5.46	5.34	2.81	3.65	0.12	7.13

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
282	3.42	3.98	2.59	4.13	0.29	5.63
283	4.58	6.22	3.05	4.66	0.36	7.65
284	4.86	4.68	2.85	5.75	0.85	6.83
285	5.47	6.71	2.83	4.23	0.85	5.96
286	5.68	6.56	2.78	4.3	0.18	7.35
288	6.41	6.52	2.74	3.97	0.27	8.13
291	6.49	6.19	2.97	5.63	0.81	7.54
293	3.44	4.28	2.52	4.93	0.09	7.13
311	2.67	3.93	2.57	3.54	0.2	7.79
312	5.65	5.24	2.53	5.56	0.46	6.58
313	4.64	6.78	2.67	4.39	0.27	7.17
314	3.12	6.71	2.60	5.03	0.33	5.83
315	2.95	6.49	2.49	4.75	0.37	6.54
316	5.11	7.92	2.50	3.01	0.24	8.04
317	4.11	6.29	2.61	3.6	0.28	7
318	4	7.84	2.46	2.6	0.2	7.63
319	4.34	4.03	2.58	6.1	0.57	6.54
321	3.86	6.31	2.57	3.51	0.16	7.25
328	5.03	6.13	2.98	4.56	0.34	7.33
329	4.67	3.85	3.07	5.34	0.23	7.21
330	2.78	7.85	2.77	4.51	0.49	7.71
331	3.79	4.97	2.74	4.86	0.37	7.92
333	3.71	5.3	2.51	2.82	0.11	7.5
334	4.79	7.82	3.48	2.27	0.14	7.92
336	5.64	6.86	3.40	2.71	0	6.79
337	4.78	5.5	2.69	3.75	0.12	7.5
340	2.35	7.73	2.56	3.26	0.16	7.87
341	5.67	6.66	2.44	3.06	0.06	7.58
342	4.03	6.88	2.65	3.65	0.41	6
343	5.7	6.4	2.60	4.06	0.28	7.42

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
345	4.23	6.09	2.74	3.8	0.29	6.63
346	5.26	8.61	2.50	3.71	0.12	8.88
347	3.03	5.08	2.63	4.83	0.18	7.5
351	4.81	5.64	2.47	2.83	0.04	7
362	4	6.81	2.70	2.64	0.24	7.58
377	5.01	6.51	3.22	3.5	0.13	6.33
381	3.14	6.35	2.53	3.87	0.09	6.96
382	6.47	6.46	2.64	4.03	0.72	6.73
386	5.56	5.71	2.52	4.38	0.41	7.75
387	5.54	6.77	3.01	2.81	0.09	7.86
388	5.77	5.16	3.19	3.37	0.06	8.29
389	4.13	6.18	2.49	3.34	0.06	5.96
390	5.42	7.28	3.50	3.99	0.27	8.21
391	4.64	5.97	2.53	3.53	0.44	7.58
392	3.7	5.53	3.16	4.86	0.59	7.75
394	3.28	2.65	1.70	6.59	0.56	3.04
396	4.96	6.7	3.42	3.1	0.35	6.92
402	6.42	5.16	3.05	5.76	0.7	5.88
403	5.5	5.74	2.72	4.84	0.82	6.33
404	4.38	6.88	2.17	3.87	0.55	6.5
405	7.47	7.29	3.37	3.74	0.42	6.46
406	6.13	6.76	3.08	3.21	0.46	7.61
408	5.54	6.52	3.27	3.78	0.54	7.29
409	4.35	6.83	2.53	3.44	0.13	7.17
502	4.55	4.21	2.53	5.12	0.63	4.7
503	5.32	5.85	2.67	4.07	0.33	6.61
504	4.18	7.03	2.60	3.08	0.34	8.13
506	3.56	6.6	2.82	2.9	0.73	6.79
509	5.25	3.46	1.60	6.72	0.69	3.08
510	3.78	7.22	2.57	2.52	0.12	7.71
511	6.6	3.41	2.19	6.67	0.6	3.83

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
512	5.91	6.94	2.78	3.27	0.34	6.54
513	5.5	5.27	2.63	5.31	0.4	5.58
514	5.11	6.99	2.60	2.83	0.09	7.25
515	5.62	3.85	2.19	6.42	0.82	3.83
516	6.46	7.1	2.42	3.83	0.25	6.58
517	2.87	7.03	2.88	2.89	0.09	6.21
518	5.29	6.96	2.47	2.86	0.24	8.21
519	6.19	3.47	1.53	6.24	0.51	4.33
520	3.99	7.51	3.52	4.08	0.06	7.58
524	5.37	5.77	2.62	4.58	0.55	7.46
530	4.03	7.17	3.13	2.89	0.17	7.54

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

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id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHcompl*	*mEffect*
1	2.93	4.96	2.48	2.65	0.33	6.87
2	4.15	7.70	2.59	4.66	0.85	6.43
3	3.45	6.43	2.67	2.89	0.28	7.37
4	3.10	6.72	2.29	5.20	0.90	7.13
6	4.99	7.19	2.76	4.14	0.13	7.21
7	5.50	7.17	2.79	3.40	0.04	7.75
9	4.37	4.47	2.56	3.83	0.31	5.92
10	3.39	3.44	2.93	4.86	0.48	6.62
11	6.21	6.49	2.02	4.63	0.41	7.00
12	5.34	5.63	2.96	5.10	0.30	8.04
13	6.26	6.74	2.49	3.01	0.23	6.08
14	3.92	7.01	2.45	2.73	0.21	8.13
16	5.54	6.97	2.99	4.09	0.27	7.25
18	5.71	6.19	2.56	4.79	0.24	7.38
19	4.09	8.41	2.47	2.79	0.05	8.83
20	5.67	4.70	2.63	3.62	0.38	5.21
21	4.40	6.90	2.94	4.87	0.11	7.04
22	4.70	7.07	2.42	3.43	0.09	7.54
23	3.90	6.86	2.83	2.89	0.09	6.33
24	3.20	6.66	2.49	3.29	0.24	7.78
25	5.12	4.90	2.58	5.36	0.81	6.30
26	4.68	5.44	3.38	5.14	0.64	7.21
27	3.62	6.23	2.49	3.26	0.20	6.50
28	4.41	7.02	2.44	3.25	0.24	6.96
29	5.36	5.90	3.22	3.84	0.21	7.58
30	6.69	6.41	2.39	3.43	0.36	6.88
31	4.93	6.38	2.71	3.58	0.13	7.25
33	5.71	5.09	2.72	3.89	0.35	6.29
34	5.96	6.72	2.43	4.24	0.42	7.29
35	5.03	7.13	2.57	3.51	0.26	7.21

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
38	4.38	6.43	2.90	3.71	0.26	7.29
39	4.42	6.90	2.58	3.37	0.34	5.58
41	5.91	6.94	2.65	3.06	0.11	7.74
42	4.97	6.28	2.60	3.70	0.21	6.88
43	4.88	6.53	2.34	3.48	0.24	6.58
44	5.52	6.80	2.44	3.37	0.24	6.75
46	4.97	6.89	2.31	4.09	0.32	6.50
48	5.67	5.55	2.66	3.45	0.97	6.50
50	6.04	5.66	2.95	3.39	0.60	7.14
51	6.70	7.04	2.76	3.10	0.22	8.08
53	5.48	5.77	2.81	4.84	0.21	7.38
54	5.51	6.26	2.68	3.64	0.26	7.13
55	6.06	6.70	2.63	3.54	0.24	7.29
56	5.22	6.18	2.71	3.97	0.32	7.37
57	5.11	5.26	2.81	4.15	0.24	6.96
58	5.23	5.24	2.82	3.73	0.30	7.38
59	5.44	5.77	2.83	3.72	0.41	7.46
62	4.96	6.45	2.90	4.87	0.31	6.42
63	2.70	6.88	2.80	3.21	0.82	7.21
64	3.00	7.31	2.51	2.80	0.10	7.42
66	4.92	3.14	2.70	5.14	0.99	5.08
68	5.98	6.49	2.45	5.12	0.74	6.00
69	3.34	5.99	2.81	4.60	0.30	6.33
70	3.51	6.81	3.47	3.33	0.34	6.13
72	5.67	5.83	2.65	3.20	0.15	6.21
73	3.41	5.38	2.47	4.15	0.23	6.50
74	3.71	6.72	2.52	4.00	0.20	6.29
75	4.05	6.12	2.24	3.94	0.31	6.46
76	5.34	7.14	2.90	3.50	0.41	5.46

Note 1: individual means of the study variables for 24 diary completion days.
Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
78	2.51	5.32	2.43	3.97	0.26	6.54
82	4.74	5.69	2.56	3.22	0.19	6.46
88	3.71	6.71	3.10	3.70	0.39	7.13
89	5.11	6.20	2.77	3.76	0.46	6.83
94	5.66	7.20	2.92	3.91	0.51	7.54
96	4.94	6.88	2.17	4.08	0.10	7.42
98	4.96	7.03	2.77	2.54	0.32	7.75
99	5.11	6.56	3.06	4.64	0.27	7.87
100	4.06	7.09	2.56	3.57	0.24	5.17
102	4.64	7.85	2.85	2.24	0.13	8.17
103	5.50	6.69	2.46	2.48	0.21	6.54
109	4.63	7.23	2.26	4.93	0.30	6.54
111	3.54	7.57	2.47	3.02	0.05	7.96
120	5.71	7.19	2.85	3.02	0.08	8.33
121	5.69	7.13	2.38	3.95	0.23	7.29
122	5.33	7.57	2.78	2.83	0.28	7.50
123	4.79	7.11	2.87	3.23	0.24	7.58
125	5.47	5.88	2.60	5.09	0.24	6.33
127	5.48	6.47	2.46	4.52	0.35	6.58
129	4.68	6.33	3.14	5.47	0.80	7.58
130	3.14	7.29	2.09	3.30	0.71	6.13
131	6.41	6.35	2.58	4.81	0.18	6.83
132	6.05	5.95	2.63	4.43	0.13	6.50
133	2.99	5.37	2.55	4.89	0.15	6.63
135	5.31	6.43	2.69	4.53	0.35	7.21
137	3.31	7.52	2.63	2.45	0.01	8.17
140	5.88	6.67	2.33	4.39	0.18	7.04
141	4.67	6.91	2.87	2.91	0.26	7.29
142	3.03	6.81	2.99	4.27	0.13	7.54
143	4.69	6.09	2.39	4.05	0.22	7.58

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id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
144	6.52	6.97	2.50	5.02	0.21	7.46
145	5.07	6.63	2.73	3.35	0.28	7.79
146	5.28	6.48	3.06	4.38	0.09	6.91
147	6.18	6.71	2.56	4.10	0.16	7.13
206	3.06	5.67	2.78	2.44	0.01	7.67
207	3.51	7.04	2.51	3.79	0.21	6.46
208	3.42	5.05	2.68	3.55	0.13	8.21
214	3.76	5.73	2.46	3.05	0.05	7.87
215	3.06	3.55	2.51	3.84	0.33	7.33
216	3.31	7.86	2.48	2.38	0.28	7.71
221	4.15	7.35	2.67	2.75	0.29	7.30
223	5.98	6.19	2.83	4.48	0.31	7.42
225	6.22	4.43	2.74	5.58	0.37	7.58
226	3.91	6.44	2.48	4.24	0.37	8.13
228	6.88	6.86	2.45	2.97	0.12	5.74
232	3.97	5.67	2.62	3.05	0.02	7.67
234	5.26	6.05	3.18	3.68	0.36	7.21
238	3.92	5.01	2.55	3.23	0.35	7.12
240	5.02	6.64	2.71	3.04	0.45	5.42
241	4.66	6.10	2.90	2.73	0.62	6.21
242	4.65	6.05	2.76	4.46	0.63	5.79
245	3.13	5.79	2.58	5.20	0.29	6.38
248	3.94	6.11	2.69	2.74	0.32	7.08
249	2.51	6.83	2.55	2.96	0.12	8.08
250	5.01	4.95	2.32	4.89	0.69	7.17
251	4.31	5.98	2.65	4.71	0.19	7.46
252	5.49	5.07	2.58	4.93	1.00	5.08
254	3.25	8.1	2.53	2.27	0.05	7.79
259	4.82	6.90	2.76	2.72	0.04	7.46

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Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness

id	*mDem*	*mRes*	*mEffort*	*mStrain*	*mHCompl*	*mEffect*
261	6.15	6.25	2.58	4.51	0.27	6.42
264	5.88	6.41	2.68	2.83	0.62	8.12
266	5.43	7.20	2.85	4.03	0.41	7.46
271	5.95	6.64	2.44	4.55	0.33	6.67
272	3.93	4.43	2.44	3.91	0.41	6.46
282	3.73	3.58	2.85	4.23	0.49	5.46
283	5.51	6.47	2.83	4.05	0.59	8.29
284	5.11	4.91	2.99	6.13	0.70	7.33
286	5.39	6.01	2.69	4.49	0.12	6.79
311	3.36	4.24	2.67	2.91	0.18	7.38
313	4.73	6.41	2.82	4.61	0.31	6.29
315	2.68	5.93	2.58	3.52	0.33	5.58
316	6.05	7.49	2.56	3.03	0.25	7.67
317	3.48	6.61	2.25	2.79	0.14	6.83
318	3.95	7.55	2.14	2.77	0.19	7.00
319	4.89	5.72	2.69	3.22	0.64	7.83
321	3.01	5.61	2.48	2.94	0.28	7.25
329	4.89	5.28	3.24	3.35	0.06	7.25
330	3.75	7.19	2.73	4.90	0.32	7.17
346	4.99	7.32	2.47	3.04	0.05	7.79
347	3.57	6.49	2.53	2.80	0.11	7.08
388	5.29	6.78	2.63	3.01	0.43	8.33
403	3.95	5.60	2.58	3.25	0.26	5.67

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Note 2: **mDem**: mean demands, **mRes**: mean resources, **mEffort**: mean effort, **mStrain**: mean strain, **mHCompl**: mean health complaints, **mEffect**: mean effectiveness