

STRESS MODELS: A REVIEW AND SUGGESTED NEW DIRECTION

George M. Mark and Andrew P. Smith

CHAPTER OVERVIEW

This chapter gives an overview of how changes in the nature of many work environments have led to increases in stressful job characteristics, and how these characteristics may be implicated in many stress-related physical and psychological problems. The economic and human consequences of these issues are outlined, and the nature of 'work stress' is defined. Many of the major theoretical models that depict the stress process are described, with particular attention paid to the most influential. It is proposed that while current stress models present fruitful frameworks for stress research, many existing models suffer from being either too narrow in scope and lacking a role for individual differences, or too broad and complex, and lacking in predictive validity. A new approach that combines many of the features of existing models is proposed, which includes strong roles for psychosocial stressors, individual differences, and subjective perceptions. Some research based on this new approach is briefly described, and it is suggested that the proposed model could be a useful new direction for stress research.

THE CHANGING WORK ENVIRONMENT AND ITS EFFECTS

It is a common perception that working life is changing in Britain and across the world, and these changes have led to new challenges and problems for organisations and employees. In recent years this has been characterised by the decline of manufacturing and many forms of industry in the UK, the advance of IT and the service sector, more short-term contracts, outsourcing, mergers, automisation, trade union declines, globalisation and more international competition (Cox & Griffiths, 1995; Schabracq & Cooper, 2000). The majority of these changes mean that workers are under growing pressure to compete, adapt, and learn new skills in order to meet the demands of their work (Cox & Griffiths, 1995). Schabracq and Cooper (2000) state that the combination of new technology, globalised

economies, and new organisational products and processes, have caused unprecedented changes and increasing stakes.

These shifts in the nature of organisations may result in increasingly “stressful” working environments, which can be manifested in many forms. These include a lack of control at work, shorter holidays, longer hours, insufficient rewards, job insecurity, poor promotion prospects, increased time pressure, lack of support, poor feedback, isolation, harassment, role conflict, and work-life balance issues (Griffiths, 1998). The UK Health and Safety Executive (HSE, 2007) has attempted to categorise the key work design factors which may relate to stress-related health issues. These are presented as part of a “Management Standards” framework and include: Demands; Control; Support; Relationships; Role; and Organisational change.

All of the pressures listed above are known as “psychosocial stressors”, and these have been implicated as risk factors for many physical and psychological problems, including increased risks of heart disease, gastrointestinal problems, anxiety, depression, burnout, absence, fatigue, accidents, substance misuse, musculoskeletal disorders, work-family conflict, and many other problems (Cox & Griffiths, 1995; Gianakos, 2002; HSE, 2007). These outcomes can also have serious consequences for employers, potentially leading to high turnover, absence, strikes, decreased productivity, low morale, etc.

THE ECONOMIC AND HEALTH COSTS OF STRESS RELATED ILLNESS

The economic and health costs of stressful work environments may be much greater than many suspect. Cardiovascular illness has been strongly implicated as a potential health outcome for those exposed to stressful work conditions (Karasek, 1979). In Britain, heart disease accounts for a loss of 70 million working days per year and causes 180,000 deaths (Earnshaw & Cooper, 1994). Alcohol misuse, which may be related to work stress in some individuals, costs the UK economy an estimated £2.2 billion from sickness absence and turnover (Earnshaw & Cooper, 1994).

The Confederation of British Industry claims that the average cost to businesses of sickness absence, including musculoskeletal disorders in 2003 was £11 billion (a 3.7% rise over 2002) or £588 per employee. Cox, Griffiths, and Rial-Gonzalez (2000) cite an EU study from 1996 which showed that 29% of surveyed workers believed that work had affected their health, with 23% of respondents claiming to have been absent from

work in the previous 12 months due to stress-related issues. The study found that the average number of days absent was 4 days per year, or 600 million working days across the EU. A study of 46,000 US employees by Goetzel, Anderson, Whitmer, Ozminkowski, Dunn and Wasserman (1998) showed that the health care costs of those suffering from high levels of stress were 46% higher than those not suffering stress.

A large body of literature also suggests that work stress is closely related to anxiety and depression (Wang & Patten, 2001) and Tennant (2001) suggests that depression is the most likely adverse psychological outcome of exposure to work stress. A survey by Hodgson, Jones, Elliot, and Osman (1993) found that musculoskeletal disorders, job stress and depression were the three most commonly mentioned problems in a UK sample. Gabriel (2000) found that increased stressors at work were significantly related to increased incidence of depression and anxiety, and states that depression costs the US economy over \$47 billion, and 200 million lost working days per year.

Statistics released in 2007 by the UK Health and Safety Executive, stated that from 2005-06 (HSE, 2007) work-related stress, depression, and anxiety, cost the UK economy £530 million, with 530,000 workers thought to have sought medical advice for work-related stress. Overall, 30 million working days were lost due to work related ill-health, with 6 million lost due to workplace injury. Finally, Arnold, Cooper and Robertson stated in 1995 that some estimated the total cost of sickness absence in the UK to be as much as 10% of the Gross National Product.

THE NATURE OF WORK STRESS

Cox and Griffiths (1995) suggest that many believe that there is no consensus as to the definition of the term stress, and Dewe and Trenberth (2004) claim that it is almost a tradition in work stress research to point out the difficulties surrounding the various definitions of stress. However, despite all the hyperbole, Cox and Griffiths (1995) state that, there are really only three different types of conceptions of the nature of stress. First is the “engineering” approach, where stress is seen as a stimulus or characteristic of the environment in the form of level of demand. Second is the physiological approach, where the definition of stress is based upon the physiological or biological changes that occur in the person when they are in a stress state, e.g. as a dependent variable based on neuroendocrine activation. The third view is termed the psychological approach by Cox and Griffiths (1995) where stress is not conceived of as a mere stimulus or response, but is itself the dynamic process that occurs as an individual

interacts with their environment (Cox, Griffiths & Rial-Gonzales, 2000; Cox & Mackay, 1981).

The psychological viewpoint is perhaps the most popular conceptualisation today and is considered superior by Cox and Griffiths (1995) as the engineering and physiological approaches treat people as passive vehicles for stimulus and response, and cannot account for the effects of cognitive or situational factors on performance and well-being.

There are many different models of workplace stress which are important in guiding research and practice, and these vary in popularity and empirical support. A selection of key frameworks will be outlined below, including influential models from the past and present, as well as some of the more up-to-date frameworks.

THEORIES AND MODELS OF STRESS AND WELLBEING AT WORK: PERSON-ENVIRONMENT FIT

Lewin (1951) observed that an individual's personal characteristics interacted with their work environment to determine strain, and consequent behaviour and health. This concept was developed into the Person-Environment fit model (French, 1973), which suggests that the match between a person and their work environment is key in influencing their health. For healthy conditions, it is necessary that employees' attitudes, skills, abilities and resources match the demands of their job, and that work environments should meet workers' needs, knowledge, and skills potential. Lack of fit in either of these domains can cause problems, and the greater the gap or misfit (either subjective or objective) between the person and their environment, the greater the strain as demands exceed abilities, and need exceeds supply (Sonnentag & Frese, 2003). These strains can relate to health related issues, lower productivity, and other work problems (French, Caplan & Harrison, 1982). Defence mechanisms, such as denial, reappraisal of needs, and coping, also operate in the model, to try and reduce subjective misfit (Buunk, deJonge, Ybema & deWolff, 1998).

Lazarus (1991) states that the P-E fit model represented an advance in thinking, but that the concept of fit between the person and environment is treated as static, with emphasis on stable relationships rather than the changing process of action and interaction in work contexts. Buunk et al. (1998) state that empirical support for the theory is limited.

THE JOB CHARACTERISTICS MODEL

Hackman and Oldham's (1980) job characteristics model focuses on important aspects of job characteristics, such as skill variety, task identity, task significance, autonomy, and feedback. These characteristics are proposed to lead to 'critical psychological states' of experienced meaningfulness, and experienced responsibility and knowledge of outcomes. It is proposed that positive or negative work characteristics give rise to mental states which lead to corresponding cognitive and behavioural outcomes, e.g. motivation, satisfaction, absenteeism, etc. In conjunction with the model, Hackman and Oldham (1980) developed the Job Diagnostic Survey, a questionnaire for job analysis, which implies key types of job-redesign including combining tasks, creating feedback methods, job enrichment, etc.

Kompier (2003) states that there is an impressive literature relating the outcome variables to the core job characteristics. The model is also well integrated with the Job Diagnostic Survey, however there is limited variety in the core job characteristics, with only a small number of key psychological states are considered.

THE VITAMIN MODEL

The Vitamin Model (Warr, 1987) proposes that certain job characteristics have an effect on mental health that is analogous to the way that vitamins work in the human body. Simply put, some job characteristics have "constant effects" where health increases linearly with increasing "dose" up to a threshold, after which increased dose has no positive or negative effect, and these may include salary, safety, and task significance (Buunk et al. 1998). Alternately, some have a curvilinear or "additional decrement" effect, where moderate levels are the most beneficial, but too much or too little can have negative health effects, for example job demands, autonomy, social support, skill utilisation, skill variety, and task feedback (van Veldhoven, de Jonge, Broersen, Kompier, & Meijman, 2002). Affective well-being is expressed in the model on three dimensions of discontent-content, anxious-comfortable, and depressed-pleased and individual characteristics can moderate the effect of job characteristics on health (Buunk et al, 1998).

Despite the interesting premise of the Vitamin model, both Sonnentag & Frese (2003) and Buunk et al. (1998) state that evidence for the model is mixed and inconclusive, and van Veldhoven, Taris, de Jonge, and Broersen (2005) state that the full model has yet to be empirically investigated.

THE MICHIGAN MODEL

The Michigan Model is based on a framework established by French and Kahn at the University of Michigan in 1962, and is sometimes known as the ISR model (Institute of Social Research) the Social Environment Model, or the Role Stress Approach. Like the P-E fit model (French et al., 1982) the Michigan Model (Caplan, Cobb, French, Harrison, Pinneau, 1975) also places much emphasis on the individual's own subjective perceptions of stressors. Environmental stressors, such as role ambiguity, conflict, lack of participation, job security, workload, lack of challenge etc, are subjectively perceived, and personality variables, demographics, and social support moderate these perceptions to lead to health outcomes (Kompier, 2003). Role issues, such as role conflict, role ambiguity, and role expectations are particularly central stressors, hence why it is sometimes known as the Role Stress Approach (Kompier, 2003).

The model was refined by Hurrell and McLaney (1988) from the U.S. National Institute of Occupational Safety and Health to result in what is known as the NIOSH model, which as well as specifying examples of how stressors, individual differences, acute reactions, and illness outcomes occur, also focuses more on the role of objective workplace factors in the aetiology of work stress (Huang, Feurstein, & Sauter, 2002).

Buunk et al. (1998) state that the Michigan model does not have a clear theoretical perspective that easily leads to specific hypotheses, and the model is hard to empirically evaluate due to its complexity. Mixed support was found for aspects of a simplified Michigan Model in regards to the relationship between managerial support and job satisfaction by Jones, Smith, and Johnston (2005), however a general lack of empirical support means it does not have much predictive validity for health outcomes, unlike other models such as the well-known Demand-Control model (Karasek, 1979).

DEMAND CONTROL SUPPORT MODEL

The Demands-Control model (Karasek 1979) is currently perhaps the most influential model of stress in the workplace (Kompier, 2003) and the original model focuses on the two psychosocial job characteristics of job demands and job control. The latter factor is sometimes called decision latitude (Karasek, 1979) and is made up of the sub-factors of decision authority (control over work situation) and skill discretion (possibility of using learnt skills and competencies). Cox and Griffiths (1995) call the demand-control model an "interactional" model, as it focuses on the structural features

of an individual's interactions with their environment (as opposed to the process of what is occurring in this interaction).

Karasek's (1979) research showed that those exposed to high levels of demand, as well as having low levels of job control (high-strain situation) were disproportionately more likely to show increased levels of depression, fatigue, and cardiovascular disease and mortality. However, the lowest levels of illness were in individuals with moderate or even high demands, if they also had high levels of job control (challenge situation). Karasek (1979) thus proposed an interaction where high demands and low control would predict high strain, but that high control would buffer the negative effect of demands on outcomes. The model was expanded (Johnson & Hall, 1988) to include social support (DCS) as evidence suggested that support may act as a buffer in high demand situations (Cooper, Dewe, & O'Driscoll, 2001; Karasek & Theorell, 1990; Lim, 1996).

There is significant evidence in a variety of populations associating health outcomes with control, demands, and support (Van der Doef and Maes, 1999). However, there is mixed support for the interactive effects of demands and controls, with some claiming these effects to be largely additive (Warr, 1990).

Despite the later inclusion of social support, the model is limited in the number of job characteristics it considers, which may not reflect the dynamic multi-stressor nature of modern workplaces. While the model has good predictive validity at the macro level, it does not take account of individual differences in susceptibility to stressors, and can't explain why the same levels of demand and control in two individuals may give rise to different behavioural or health outcomes (Perrewe and Zellars, 1999). This issue may be related to the "oversimplification assumption" (Payne, Jick & Burke, 1982) which can arise from too great a focus on environmental demands, and is the notion that the presence of an environmental demand is an indication that the event is demanding, when in some cases for some individuals it is not.

Other criticisms of the DCS model include its definition of demand as based primarily on workload and not other types of demand (Cox et al. 2000) and that the conceptualisation of control is quite a narrow view of this multi-dimensional construct (Carayon, 1993). The DCS model also assumes that high control is always a desirable state (and a positive moderator of negative demands) however it could be argued that some individuals may not see job control as desirable, and may find having control a stressor in itself, for example if they have a low sense of self efficacy.

The implications for job redesign are that healthy jobs ought to have high levels of control without extreme levels of demand, and with wide networks of social support. The efficacy of these measures has been reported by Van der Doef & Maes (1998) Ganster (1995) and Kristensen (1995). The DCS is a popular and influential model of workplace stress with good predictive validity, however it is limited in encapsulating the complexities of the stress process, and could perhaps be most useful when used in conjunction with other models, particularly those that may include individual difference components.

TRANSACTIONAL THEORIES OF STRESS

Cox and Griffiths (1995) make a distinction between two types of psychological model of work stress: interactional or structural approaches, such as the DCS model; and transactional or process models.

Interactional models focus on the structural characteristics of the stress process, i.e. which stressors are likely to lead to which outcomes in which populations, however transactional views are more cognitive, and focus on the dynamic relationship that occurs between individuals and their environment in terms of mental and emotional processes (Cox et al. 2000). Transactional views often place emphasis on the role of subjective perceptions of the environment, and are more likely to acknowledge the possible impact of individual difference factors, such as differences in coping, appraisal, personality, locus of control etc. Some of the main models with these features in the occupational stress literature are described below.

EFFORT-REWARD IMBALANCE

The Effort-Reward imbalance model (ERI: Siegrist, 1996) is a popular view of stress at work, that like DCS model, was developed with a focus on cardiovascular disease (Siegrist, 1996). The ERI model has some key transactional features, as it places emphasis on subjective perceptions of the environment, however the role of individual differences and the explication of internal processes is less developed than in other transactional models, such as those by Folkman and Lazarus (1980) and Cox (1987).

The key concept of ERI is one of reciprocity, where effort at work should be compensated by suitable rewards, and a mismatch between these will lead to stressful experiences (Peter & Siegrist, 1999). Rewards are defined as money, esteem, career opportunities, and security. Effort is proposed to

have two components: intrinsic effort, from the personal motivations of the individual, such as a need for control and overcommitment (a tendency to make excessive efforts or be committed to unrealistic goals); and extrinsic motivations, or external pressures, such as workload (similar to the concept of job demands in the DCS model, Kompier, 2003). External demands are also proposed to relate to the status of the labour market and how easily alternative employment can be found.

According to Peter and Siegrist (1999) the DCS model is only concerned with extrinsic factors, whereas the ERI uses extrinsic factors (extrinsic effort) and intrinsic factors (overcommitment). The ERI model also differs from the DCS model in that it is not the "actual" level of mismatch between efforts and rewards that is important, but rather their perceived mismatch (Siegrist, 1996). This implies a role for individual differences, as different subjective perceptions are likely to result from variability between individuals, however how this may happen in practice is not explored in the model.

There is much support for the principles of the ERI model, including Siegrist, Peter, Junge, Cremer and Seidel (1990) and the Whitehall II studies (Bosma, Peter, Siegrist, & Marmot, 1998) which showed significantly elevated risks of heart disease in those exposed to high effort-low reward conditions, compared to low effort and/or high reward. Van Vegchel, de Jonge, Bakker, and Schaufeli (2002) also found strong effects for the reward components relating to self-esteem and job security on psychosomatic complaints and exhaustion, and de Jonge, Bosma, Peter, and Siegrist (2000) found that individuals with high efforts and low rewards were up to 21 times more likely to suffer emotional exhaustion than those with low efforts and high rewards.

The relationship between effort and rewards can be operationalised in different ways including as a ratio of efforts divided by rewards multiplied by a correction factor, (where zero indicates low efforts and high rewards, and values beyond 1 indicating high efforts not met by rewards) and as a multiplicative interaction term. Van Vegchel, de Jonge, Bosma, and Schaufeli (2005) compared results using these different methods and found evidence that the latter ratio term may be better at significantly predicting outcomes.

The ERI expands on the DCS model in several key ways and the predictive validity of the model also appears good, however the role of individual differences is limited to the intrinsic effort dimension, and there are no proposed mechanisms by which individual differences may influence the stress perception process. Kompier (2003) states that ERI doesn't

provide a detailed redesign theory, but like the DCS model implies basic design principles. However research has shown that there is some scope for the DCS and ERI models to be used in conjunction, as each can add cumulatively to the explanation of variance in emotional and physical health outcomes (de Jonge et al. 2000).

THE COGNITIVE THEORY OF PSYCHOLOGICAL STRESS AND COPING

Lazarus and Folkman's theory of psychological stress and coping (1980) is perhaps the most theoretically influential transactional theory. Sometimes known as the Cognitive-Relational approach, the individual and their environment are seen as coexisting in a dynamic relationship, where stress is the psychological and emotional state that is internally represented as part of a stressful transaction (Folkman, Lazarus, Gruen & DeLongis, 1986). The two key concepts in this process are appraisal and coping (Cox et al., 2000).

Folkman et al (1986) describe primary appraisal as the first stage of the appraisal process, where encounters are subjectively evaluated to see what is at stake in terms of potential risk (Perrewe & Zellars, 1999) and these assessments allow for the influence of individual differences, because the nature of what is considered stressful is individual-specific (Park & Folkman, 1997).

In later work, Park and Folkman (1997) write that the attribution of meaning that individuals give to events, can be framed by existing beliefs based on their global meaning. These are enduring beliefs and valued goals, based on fundamental assumptions, theories of reality (e.g. religion), self-worth, life experience etc. Park and Folkman (1997) propose that the making of situational meaning is what occurs when an individual's global beliefs and goals interact with the specifics of a particular person-environment transaction which are defined by the processes of appraisal and coping.

If a situation is evaluated as potentially stressful, then secondary appraisal occurs, which is where the individual evaluates if the potential harm can be altered, avoided or prevented (Park & Folkman, 1997), where to assign blame or credit, and what future expectations are. Potential actions or ways of coping are assessed, informed by past coping experience, personality, personal resources (and presumably global meaning). Folkman and Lazarus (1980) described many types of coping behaviours, and suggested that they could be aggregated into two major categories of coping response: problem-focused coping (attempts to cope using more rational problem

solving type approaches) or emotion-focused coping (emotional-oriented coping approaches) each of which are suitable in different kinds of situation. While the problem focused/emotion focused distinction has been popular in research, many argue that it is important to split coping into more distinct categories (many based on Folkman and Lazarus' work) such as problem focused coping, seeking social support, blamed self, wishful thinking, and avoidance (Vitaliano, Russo, Carr, Maiuro, and Becker, 1985) and action oriented coping, accommodation, positive thinking, seeking support, self blame and defence (Falkum, Olff, and Aasland, 1997).

Once possible coping methods are assessed and selected, then the final stage of the model occurs, where coping is implemented. Coping has been characterised as (Folkman et al, 1986) "cognitive and behavioural efforts to manage (reduce, minimise, master, or tolerate) the internal and external demands of the person-environment transaction that is appraised as taxing or exceeding the person's resources". Park and Folkman (1997) suggest that coping is the main method by which incongruence between global meaning and situational meaning is managed. A failure to cope successfully (from excessive demands or lack of resources) is likely to lead to stress and negative health and organisational outcomes (Cox et al. 2000).

The cognitive-relational model gives weight to the job situation, subjective perceptions, and the potential influence of various individual differences factors, and indeed Lazarus argues (1991) that many stress management interventions fail because they treat all people as if they were alike, and it is useful to view the individual, the group, and the workplace as a single analytic unit, rather than separate variables which are to be manipulated independently.

The complexity of this model means that it is hard to empirically evaluate, however examples include: Folkman et al. (1986) where personality, primary appraisal, secondary appraisal and coping were investigated in stressful situations in a sample of 150 adults, and support was found for aspects of the model in the prediction of psychological symptoms; and Dewe (1991) who found that primary and secondary appraisal factors, and coping, contributed significantly to the prediction of emotional discomfort in a workplace sample. There has also been a large amount of research on the relationship between coping and health outcomes in a variety of situations. Zeidner (1994) found that emotion focused coping significantly predicted anxiety during university finals, and those with less active coping behaviours showed higher levels of depression, and Haghightgou and Peterson (1995) found similar results in a sample of Iranian students. Lease (1999) found that avoidance coping significantly predicted role stress in academics. Welbourne, Eggerth, Hartley, Andrew, and Sanchez

(2007) found that problem-solving coping associated with increased job satisfaction, and finally, Tong, Bishop, Diong, Enklemann, Why, Ang and Khader (2004) who found that stress experience was associated with avoidance and re-appraisal coping.

Cooper et al. (2001) and Cox and Ferguson (1991) have stated that despite the widespread use of the term “coping” there are difficulties surrounding its definition, as it can be seen as a process, a behaviour, as a stable trait, or as situation specific, and Briner, Harris and Daniels (2004) have suggested that the conception of appraisal is too simplistic and doesn't include individuals' histories, and anticipated futures. Cox (1987) also states that the processes discussed may not be as rational as presented in transactional theories.

COX'S TRANSACTIONAL MODEL OF OCCUPATIONAL STRESS

Cox's transactional model of work stress (Cox, 1978; Cox & Mackay, 1981; Cox et al, 2000) is closely related to the work of Lazarus and colleagues and many of the processes and stages in the two models are similar, however there are certain important differences in Cox's model, particularly a clarified structure and greater focus on occupational health and individual differences (Cox & Ferguson, 1991).

Cox's framework (1978) has five stages. The first stage represents the demand or job characteristics of the environment, and the second stage represents the individuals' perceptions of these demands relative to their ability to cope (Cox et al., 2000). These two stages could be seen as analogous to the primary appraisal stage of Folkman and Lazarus' model (1981). Stress is conceptualised as being the psychological state that occurs when there is a mismatch between perceptions of the significance of a demand, and beliefs about one's ability to cope with it (Cox et al, 2000). Cox and Ferguson (1991) describe how this primary appraisal process is influenced by the internal and external demands experienced, as well as coping abilities and resources, and support from others.

The third stage of the model is associated with the mental and physical changes that the person undergoes as a result of the recognition of a stress state, and involves secondary appraisal and coping, which are analogous to those in Folkman and Lazarus' model (Cox et al, 2000). Cox and Ferguson (1991) describe the psychological changes that occur in a stress state, including mood change, emotional experience, e.g. tension, feeling worn out, or depressed etc, as the defining feature of the stress state for the

individual. Thus the awareness of a stressful problem initiates a cycle of behaviours that are “an adjustment to the situation, or an adjustment of the situation” failure of which leads to negative health outcomes. The fourth stage of the model represents the outcomes or consequences of coping, and finally, the fifth and last stage is feedback which is proposed to occur in relation to all other stages (Cox et al, 2000).

Cox and Ferguson (1991) state that primary appraisal is a continual monitoring process, and secondary appraisal is a distinct decision making process, and that the entire stress process is grounded in a “problem solving” context. Cox (1987) writes that the basic framework for this context involves recognition of a problem, diagnosis, suggestion of possible solutions, evaluation of suggested solutions, implementation, feedback, and learning, and that such a problem-solving approach can also be used as the basis for organisational interventions.

Cox and Ferguson (1991) make a point of stressing the importance of individual differences in this transactional model. Differences in locus of control, hardiness, and coping resources are deemed particularly important, and may exert effects in the model via a mediating role in appraisal, and a moderating role in helping to determine health outcomes.

A clearer structure, the inclusion of a feedback stage, and the emphasis on individual differences which exert an influence by mediation and moderation, represent important steps forward over many other models, however Cox warns that in reality, the problem solving process in a stress setting is unlikely to be so rational (Cox, 1987). For example, appraisal and coping processes may not be open to such conscious evaluation, and may be carried out with bias, insufficient information, to appear irrational or counterproductive, with consideration of a limited number of solutions, and with little or no attention paid to feedback or past learning. However, it could be argued that these problems could be what makes the difference between successful and unsuccessful problem-solving episodes.

Much of the evidence related to the above model is very similar to that related to Folkman and Lazarus’ model, for example research on coping and appraisal. However, while there is plenty of supporting research on the main effects of individual difference factors such as hardiness, locus of control, self-efficacy, and their relationship to health outcomes, results into the mediating and moderating roles of these factors are far less conclusive (see Cooper et al., 2001; Spector, 2003; Parkes, 1994). Moreover, like the cognitive-relational approach, the very complexity of Cox’s model means that it is hard to empirically capture, unlike the more simple models of Karasek (1979) and Siegrist (1996).

DEMAND-SKILL-SUPPORT MODEL

Recently a newer wave of stress models have emerged that take important aspects of existing models and try to develop them in new ways. Examples of these include the Demand-Skill-Support model, Demand-Induced-Strain-Compensation model, and the Job-Demands-Resources model.

The Demand-Skill-Support model (DSS: van Veldhoven, Taris, de Jonge, & Broersen, 2005) was developed largely based on the DCS model (Karasek and Theorell, 1990) with the aim of specifying a model as parsimonious as possible (i.e., with a minimum number of factors) that still would be able to predict stress in a wide variety of situations and occupations.

On a sample of 37,000 Dutch employees in four branches of industry, van Veldhoven et al. (2005) investigated the relationships between pace and amount of work, physical effort, skill utilisation, task autonomy, quality of social relationships with colleagues, quality of relationships with supervisor, and job security, with the outcome variables of work-related fatigue, task satisfaction, and organisational commitment. The best fit to the data was found to be a model that included the four factors of physical and time demands, skill utilisation, and quality of social relationships (combined for colleagues and co-workers). Task autonomy and job security did not make significant improvements in predicting outcomes over the above four factors.

On the basis of the results, van Veldhoven et al. (2005) proposed that quantitative and qualitative demands were more likely to relate to health outcomes and strain, and skill utilisation, and social support were more likely to relate to attitudinal outcomes and wellbeing. The four-factor solution was also found to be a good fit for the data over four branches of industry, suggesting it could be applied to a range of occupational situations.

While the model was formulated with parsimony in mind, the authors do acknowledge that only a limited number of job characteristics were used, and the model could perhaps be improved with the inclusion of more factors. However they conclude that a general four-factor DCS based model is a good starting point for research.

The sample size used for the development of this model is impressive, however the DSS gives little recognition of the impact of individual differences in the stress process, or subjective perceptions of job demands. This method is in line with the authors' stated aims of a parsimonious model that captures aspects of stressful environments with the minimum

of factors, and such a model could be useful as a preliminary screening tool to get a broad view of the levels of stressors in an organisation. However it goes against the popular trend of viewing stress as a relative, subjective, and transactional process (Dewe, 1991; Dewe & Trenberth, 2004; Perrewe & Zellars, 1999; Florio, Donnelly, & Zevon, 1998; Frese & Zapf, 1999; Spector, 2003). The DSS may benefit from further testing with the inclusion of other job characteristics.

DEMAND INDUCED STRAIN COMPENSATION MODEL

De Jonge et al. (2000) found that sub-factors of the Demands-Control-Support and Effort-Reward-Imbalance models had independent cumulative effects in the prediction of emotional exhaustion, job satisfaction, and psychosomatic and physical health complaints. Similar results were found by Rydstedt, Devereaux and Sverke (2007) and both they and de Jonge et al. (2000) conclude that future research should look to refining and combining aspects of these two models.

An approach that attempts to do this is the Demand-Induced-Strain-Compensation model which uses factors from the above models (de Jonge & Dormann, 2003). The model was developed particularly with a focus on stress in service jobs. The central assumption of the model is that there are various types of demands and resources, and that each of these are matched, so that emotional demands at work are most likely to be compensated for by emotional resources, cognitive demands by cognitive resources, and physical demands by physical resources (van Veldhoven et al., 2005). Furthermore the strongest interactions between demands and resources are likely to occur also on these qualitatively matched dimensions, and that each of these interactions is related to a particular type of emotional or affective outcome (Van Vegchel et al., 2005). For example, if high behavioural demands are met with low behavioural resources, high cognitive demands with low cognitive resources, and high emotional demands with low emotional resources, then adverse health is likely to result. However, if high demands in each dimension are met with high resources, then motivation, learning and growth are likely to result. This has been called the "triple match principle" (de Jonge & Dormann, 2003). The model therefore takes the principles of balance, reciprocity, demands, and resources of different types, from the ERI and DCS models. More research is needed on this model, particularly with respect to the interesting hypothesis that resources in a particular domain are best compensated by resources in the same domain, however citing de Jonge and Dormann (2004), Van Vegchel et al. (2005) state that preliminary results are promising.

THE JOB DEMANDS-RESOURCES MODEL

Finally, an interesting new approach that attempts to develop and expand upon existing research is the Job Demands-Resources Model (JD-R; Demerouti, Bakker, Nachreiner & Schaufeli, 2001). The JD-R model takes cues from several of the approaches described above, and categorises psychosocial factors into the global categories of job demands and job resources to see how these may influence illness and organisational commitment (Llorens, Bakker, Schaufeli, & Salanova, 2006). Demands are said to be physical or social aspects of a job that require efforts and thus have physical and mental costs, and resources as workplace or organisational aspects that help with the achievement of work goals, reduce demands, or stimulate growth and development. Demanding and resource providing job conditions influence the key processes of health impairment and motivation. Burnout and work engagement are proposed to be opposing psychological states that lead to health effects (Llorens et al., 2006) e.g. organisational commitment may be damaged by burnout through the health impairment process, or boosted by engagement through the motivation process.

Llorens et al. (2006) maintain that the JD-R is a heuristic, overarching model, the principles of which can be applied to any occupational setting regardless of the particular demands or resources involved. The JD-R model also expands upon the DCS model by stating that many different resources may buffer the impact of many different demands on stress outcomes (Bakker, Demerouti, and Euwema, 2005). Research has supported aspects of the model, for example Llorens et al. (2006) show that burnout mediates a negative relationship between job demands and organisational commitment in Dutch and Spanish samples, and engagement plays a mediating role in the relationship between resources and commitment. Also, Bakker et al. (2005) showed that interactions between demands and resources explained a unique proportion of the variance in exhaustion and cynicism outcomes.

Xanthopoulou, Bakker, Demerouti and Schaufeli (2007) state that despite the support that has been gained for the JD-R model, its basis on a tradition of research derived from the demands-control model of Karasek (1979) means that much research on the JD-R has focused only on the characteristics of the work environment. Xanthopoulou et al. (2007) have attempted to further the research based on the JD-R model, by adding the category of personal resources, i.e., characteristics that contribute to resiliency, such as general self-efficacy, organisational based self-esteem (OBSE), optimism etc, and that these resources should moderate and mediate the relationships between environment and outcomes. Xanthopoulou et al.

(2007) cite past research has supported a moderating role of efficacy, self esteem, and optimism on outcomes (including Van Yperen & Sijnders, 2000, Pierce & Gardner, 2004, and Mäkikangas & Kinnunen, 2003). Unfortunately, Xanthopoulou et al. (2007) found no moderating role for personal resources. However evidence was found that personal resources mediated the relationship between job resources, and work engagement and exhaustion.

Despite the mixed support for a role of personal resources in the JD-R framework, the model represents a significant theoretical step forward over the JDC and DSS models, and the addition of personal factors into a job demands and resources-based model may well be a fruitful direction for future research.

THE IMPORTANCE OF INDIVIDUAL DIFFERENCES

The sections above describe a range of important stress models that have been influential in the field of work stress research. It is clear that there are models of different types, for example those that mainly focus on job characteristics, such as the DCS and DSS models, and those include a role for subjective perceptions of stressors, such as the Michigan and P-E fit models, and models such as the ERI that combine aspects of these features. There are the models that focus on the psychological processes that may occur in stressful interactions, such as the transactional models of Folkman and Lazarus, and Cox, and finally there are models that try and combine aspects of all of the above models, such as the DISC and JD-R models.

While these distinctions are useful for understanding the development of stress models, there is another feature of stress frameworks that is important. This feature is whether or not the framework takes account or includes a role for individual difference variables. While the possible influence of IDs is implicit in models that treat stressors as subjective (such as the ERI model and others) few models actually have an explicit role for individual difference factors integrated into them. The ERI model has the ID factor of intrinsic effort, but this factor is narrow and its influence on subjective perceptions is not specified. The theories of Folkman and Lazarus (1980) and Cox (1987) pay specific attention to the individual factors of coping styles, and new research on the JD-R model includes a role for self-esteem, efficacy, and optimism, but in other models an explicit role for ID factors is uncommon.

There are a large range of individual difference variables (IDs) that may be involved in the stress process. These include trait anxiety, NA, personality,

self esteem, locus of control, coping style, hardiness, type A, attributional style, demographics, expectations, preferences, commitment, health related factors and abilities and skills (Payne, 1988; Parkes, 1994).

Cox and Ferguson (1991) state that ID factors are often seen to function in the stress process as either “components or mediators of stress appraisal” or as “moderators of the stress-outcome relationship”. Mediators are variables that transmit an effect (for example by affecting primary appraisal, Cox & Ferguson, 1991) but do not qualitatively change the effect (Baron & Kenny, 1986) and moderators are variables that change the direction or strength of a relationship between other variables (Cox & Ferguson, 1991) or determine when certain responses to stress will occur (for example affecting secondary appraisal and coping processes).

Parkes (1994) argues that research into individual differences is necessary to clarify their effects in predicting stress, and to implement person and environment focused interventions. Briner, Harris and Daniels (2004) state that individual contexts and behaviour are vital to understand the causes of strain, stress, and coping, and that it may make no sense to consider stressful job characteristics as “out there” without subjective individual perceptions taken into account. Indeed Briner et al. (2004) propose that stressors are not even stressors if the individual does not perceive them as such, a viewpoint echoed in models such as Person-Environment fit, the ERI model, and the transactional models of Folkman and Lazarus and Cox.

A GAP IN THE LITERATURE?

The number of stress models described illustrates how many different viewpoints there are of occupational stress, and show how complex these processes may be, and while the range of stress models in the workplace is impressive, certain viewpoints have historically been more popular. Dewe claimed in 1991 that the primary concern for many years in occupational research had been to explore the relationship between stimulus and response, and that despite the advances in alternate views with a more relational perspective, there had still been no real attempt to actually understand what stress actually is. Dewe (1991) argued that there was a need to develop theoretical and empirically supported transactional frameworks using appropriate measurement strategies. Schaubroeck agreed in 1999 and stated that there was no well-accepted working model of appraisal and coping processes, despite a requirement for one. However, little seemed to have changed by 2004, when Briner, Harris and Daniels claimed that very little stress research makes a new contribution, with

only a narrow range of methods used in the study of stress. Further, they claimed that there is little new theory and that a fundamental reappraisal of the field was needed.

Dewe (1991) argued that transactional perspectives were largely accepted at a conceptual level by most researchers, and individual differences and subjective perceptions were seen by many as integral to the entire stress process (for example Parkes, 1994, and Cox & Ferguson, 1991). Indeed, many authors such as Dewe (1991), Dewe and Trenberth (2004), Perrewe and Zellars (1999), Florio, Donnelly, and Zevon (1998), Frese and Zapf (1999), and Spector (2003) suggest that transactional conceptualisations are ecologically valid and theoretically rich, yet empirical research is still more likely to be based on models that focus on environmental stressors, or that largely neglect individual differences.

Jick and Mitz (1985) and Long, Kahn, and Schutz, (1992) write that research that uses multiple-factors (including individual differences) is necessary when a number of possible independent variables may be implicated in an outcome, because without combining them, the relative explanatory power of the different IVs cannot be known, and no interactions between variables can be tested.

TOO LITTLE COMPLEXITY IN STRESS-RELATED RESEARCH

Despite the support of many of the authors for transactional-type models, full-blown transactional theories (i.e., theories that describe the stress process in terms of antecedent factors, cognitive processes, emotional experiences, and health outcomes, Cox, 1978; Cox & Griffiths, 1995; Lazarus, 1991) are complex and difficult to test, and may not be the only way forward. Indeed, job characteristics type models that focus primarily on work conditions may not be the most accurate depiction of the stress process for individuals. However, it is possible that they are “good enough” to capture the range of stress-related factors for most work situations and individuals.

While it is important to avoid falling into the oversimplification assumption (that the presence of an environmental stressor implies that an individual will be “stressed” by it) job characteristics models may be a good way of gaining an initial idea of how healthy a workplace may be, and which roles or departments in an organisation may require further stress audits. Models such as the DCS, DSS, ERI, and DISC may be very useful for this kind of work, and such a view is reflected in the recent development of a measurement tool by the UK Health and Safety Executive, that combines items from DCS and ERI questionnaires (HSE, 2007).

In 1991, Lazarus commented on the vital need to understand individual patterns in stress reactions, however Brief and George (1991) responded by claiming that Lazarus may go too far, and that it is instead useful to try and understand what factors affect most workers exposed to them. Following this, job characteristic models could be described as having a “majority of the people, the majority of the time” approach that work at a macro level, but do not help us to understand much about what stressful encounters are like for individuals with different characteristics, or indeed how to design individually relevant interventions.

TOO MUCH COMPLEXITY IN STRESS-RELATED RESEARCH

The theoretical alternative to job characteristic-based research, therefore, might be seen as work that undertakes a transactional perspective, which takes a more individual-centred view, with a role for individual differences and subjective perceptions. However, another key feature of transactional stress models is (according to Cox and Griffiths, 1995) that they focus on the process of the stressful transaction that takes place in the individual when they encounter a stressful environmental stimulus. Such a focus has led to the development of structured process-oriented frameworks in the models by Folkman and Lazarus’ and Cox and colleagues, which attempt to explain the processes by which an individual perceives the presence of a threat, analyses its possible effects and ways to cope with it, foresees possible future outcomes, implements coping, experiences actual outcomes, and applies feedback. The complexity of these models means that research aimed at supporting them in entirety is a huge task, and as stated by Cox himself (1987), the actual psychological processes of appraisal and coping are unlikely to be so rational as outlined in transactional theories. Indeed, Briner, Harris, and Daniels (2004) suggest that coping (and perhaps appraisal) processes are significantly more complex than transactional theories suggest, and that personal histories and many individual factors are not accounted for in current theory.

Lazarus (1991) states that many stress interventions fail because they treat individuals as if they were all alike. He also states (as Brief & George noted in 1991) that as stress is an individual and subjective phenomenon, identifying general work conditions that affect most workers is not useful. However, the task of accounting for every factor or individual difference that may be relevant to every individual in any given job situation, or an “all of the people, all of the time” approach is particularly daunting. Of course such complexity is not directly advocated by transactional frameworks, and much work has transactional features without following the entire multiple stage aspects of some models. However, a huge array of variables and personal experiences could become relevant, when one

aggregates the mechanics of broad mental processes into discrete stages, and tries to apply the effects of individual difference variables to each.

A MIDDLE GROUND BETWEEN SIMPLICITY AND COMPLEXITY

Therefore, if job characteristic models may have too little complexity to account for individual experiences, and highly structured process-oriented transactional viewpoints may have too much, there may be an approach that sits somewhere between the two. Such an approach would need to not delve too deeply into the actual mental processes that may be occurring in a stressful transaction, but should still acknowledge the input of multiple individual difference variables, while maintaining a role for stressful job characteristics as the primary referent for subjective stress perceptions.

Brief and George (1991) suggested that it was important to try and identify negative conditions that affected most workers. If this were done, but in conjunction with also finding which individual difference characteristics most strongly affected the stress process for most workers (either to predispose individuals to view job characteristics as stressful, to exacerbate the effects of those stressful perceptions, or to buffer individuals from stressors) then this could be a view that could be said to try and consider “most of the people, most of the time”.

The latest research on the Job Demands-Resources model (Xanthopoulou et al. 2007) could be said to be an approach that has things in common with this concept, as it attempts to use job characteristics from the DCS model to represent environmental demands, and to investigate the mediating and moderating effects of the personal resources of self-efficacy, self-esteem, and optimism on outcomes. While results for this research are mixed, it represents an important framework for future research, but which could benefit from the inclusion of more individual and work characteristics.

A SUGGESTED APPROACH

On this basis of the issues presented above a new stress framework will be described. This acknowledges the important role played by psychosocial workplace stressors in the stress process, and tries to account for the role of important individual difference factors in the development of subjective experiences of stress, and in influencing the possible health-related outcomes that result from subjective stressful perceptions. This framework aims to represent key aspects of the stress process, without getting bogged down in the minutiae of more complex theories and mental processes.

Mark (2008, in preparation) developed and tested the model shown below (figure 1) which simultaneously compared a number of job characteristics and individual difference variables in the prediction of anxiety, depression, and job satisfaction, in a working population. Independent variables included: job demands, social support, decision authority, and skill discretion from the DCS model; extrinsic effort, intrinsic effort and rewards from the ERI model; 40 coping behaviours (a key feature of the transactional models) which included the categories of problem focused coping, seeking advice, self blame, wishful thinking, and escape/avoidance; attributional/explanatory styles; and age, gender, and demographic variables. This framework was called the Demands, Resources, and Individual Effects model (DRIVE).

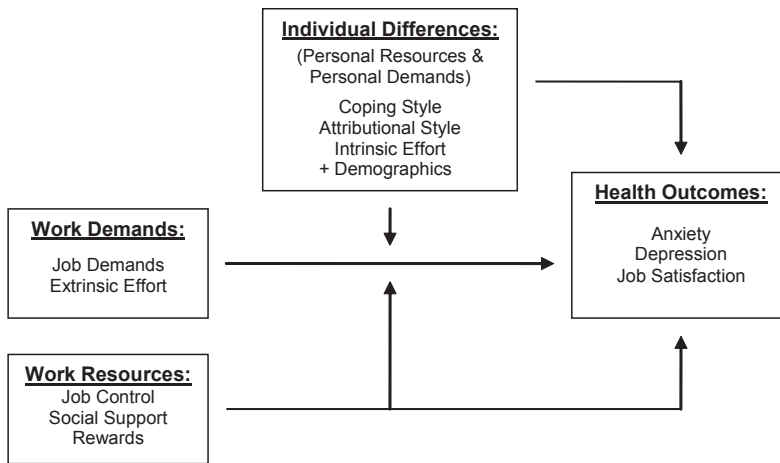


Figure 1: Simple DRIVE Model

In the model (taking a cue from the JDR), workplace and individual characteristics are conceived of in terms of work demands and resources, and individual demands and resources. Other work demands and resources could include workload, bullying, job security, management style, feedback etc, and other personal demands and resources could include self efficacy, locus of control, personality, home environment, experience, work/life balance, role conflict, etc.

The model proposes that work demands, individual differences, and work resources are all proposed to have main effect relationships on anxiety, depression, and job satisfaction (other outcomes could include organizational commitment, musculoskeletal disorders, gastro-intestinal disorders, heart disease, absence etc). It is also proposed that work resources

and individual differences may moderate the relationship between work demands and health outcomes. The individual difference variables of positive coping (problem focused coping, etc) and attributional styles can be seen as personal resources, and intrinsic effort, negative coping (self blame, etc) and attributions as “personal demands”, as maladaptive behaviours are effectively self-induced demands. This model makes no predictions about the “importance” of the different variables in predicting outcomes, and gives each type of variable (work and individual demands and resources) a theoretical equivalency.

Many aspects of the above model were supported by recent research (Mark, 2008, in preparation) notably the main effect relationships, however there was little support for a moderating effect of individual differences on work demands, and only moderate support for the effect of work resources on moderating demands. In response to the results gained, and to find out more about these relationships, a new model was developed as outlined below.

A MORE COMPLEX DRIVE MODEL

Despite being more complex than the DCS, DSS, and ERI models, the model as shown above is still relatively simplistic in representing the complexities of the workplace-individual stress process, and in particular in one key way. Although hypothesising possible individual effects in the relationship between environment and outcome, this process is described without reference to conscious or affective perceptions of psychosocial stressors, a process which is specified in the appraisal stages of transactional models. While it is implicit in the model above that individuals may not view “stressors” as stressful, this subjective process is buried in the pathway between environment and outcome.

The above model could therefore benefit from some way of representing how individuals subjectively feel about their exposure to potential psychosocial stressors (the presence of which are also subjectively measured) because without inclusion of a specifically affective component, the DRIVE model could fall foul of the oversimplification assumption.

The model shown in figure 2 has similar basic principles to the simpler DRIVE model. However, there is a major change with the inclusion of a “perceived job stress” variable. It is proposed that this variable is measured simply by asking an individual if they feel that their work makes them feel stressed - whatever that may mean to the individual. The use of a single question: “In general, how do you find your job?” with responses indicated

on a 5-point likert scale (0 = not at all stressful; 1 = mildly stressful; 2 = moderately stressful; 3 = very stressful; 4 = extremely stressful). Such a measure has been shown to be an accurate indicator of perceived stress, which measures this construct as well as many longer questionnaires (Smith, Johal, Wadsworth, Davey, Smith, & Peters, 2000).

As shown in the new DRIVE model in figure 2, perceived job stress is proposed to mediate the relationship between work demands/work resources and health outcomes. Perceived stress is hypothesised to be the mechanism by which levels of workplace psychosocial demands and resources can affect health outcomes. In other words, a psychosocial stressor won't transmit any stressful potential to lead to negative health outcomes, if the person does not perceive their work conditions to be stressful. Further, it is proposed that individual differences can not only moderate the relationship between environmental factors and perceived stress, but that they can also moderate the relationship between perceived stress and health outcomes. Likewise, individual differences (personal demands and resources) are proposed to have independent main effects on perceived job stress and health outcomes.

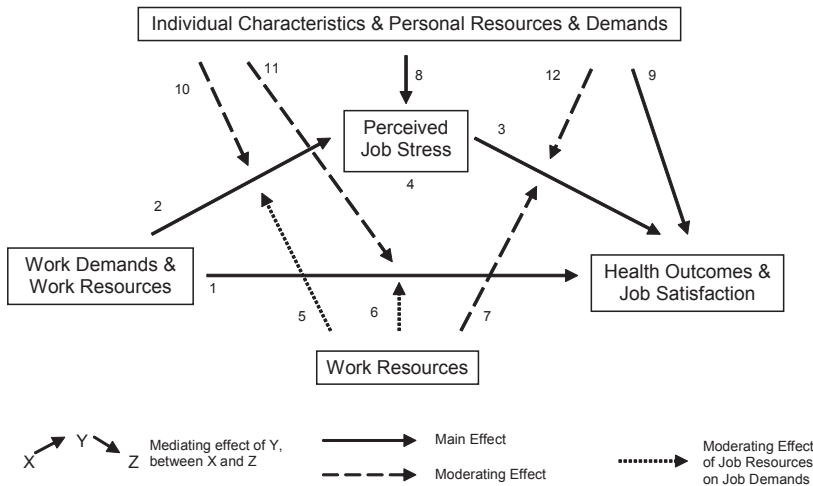


Figure 2: Enhanced DRIVE model

Like the JDR model (Xanthopoulou et al. 2007) this model is not intended at this early stage to be a predictive model, but rather a theoretical framework into which any relevant variables can be introduced. The nature of what is actually occurring inside the person in terms of mental processes, stages, and rational procedures or analyses of situations is not hypothesised. Rather,

this framework is suggested as a way of illustrating which variables and factors may relate, not how or why they relate. Twelve key relationships are proposed in the model, and these are shown below.

- 1) Work demands and work resources will significantly relate to outcomes.
- 2) Work demands and resources will significantly relate to perceived job stress.
- 3) Level of perceived job stress will significantly relate to outcomes.
- 4) Level of perceived job stress will significantly mediate the relationships between Job Demands/Resources and outcomes.
- 5) Work resources will significantly moderate the effect of work demands in the prediction of perceived job stress.
- 6) Work resources will significantly moderate the effect of work demands in the prediction of health outcomes.
- 7) Job resources will significantly moderate the effect of perceived job stress in the prediction of health outcomes.
- 8) Individual differences in the form of personal demands and resources, will be significantly related to perceived job stress.
- 9) Individual differences will be significantly related to outcomes.
- 10) Individual differences will moderate the effect of job demands on perceived stress.
- 11) Individual differences will moderate the effect of job demands on outcomes.
- 12) Individual differences will moderate the effect of perceived stress on outcomes.

FINDINGS AND IMPLICATIONS

The model proposed above was tested by Mark (2008, in preparation) in two working populations of nurses and university employees, with almost 1,200 participants. Using a series of interactive regression analyses and mediation calculations using the software Medgraph (Jose, 2004) all of the proposed relationships in the model in figure 2 above were tested. Strong evidence was found for many of the predictions and experimental hypotheses relating to these relationships were supported in regards to predictions 1, 2, 3, 4, 9 and 11 with mixed support for predictions 6 and 8. No support was found for predictions 5, 7, 8, 10 and 12.

As expected from the literature, workplace demands and resources were good predictors of health outcomes, and these factors were also found to be good predictors of perceived work stress. Also, individual difference factors in the form of positive and negative coping and attributional styles (or personal demands and resources) were shown to be important predictors of health outcomes, with intrinsic efforts the most important predictor by standardised beta weight in anxiety and depression, and rewards and attributional behaviours particularly good predictors of job satisfaction.

A large number of interactive effects found between personal characteristics and work demands and resources as depicted above by relationship 11 and these results support the case for the key role that individual differences can have in moderating the strength or direction of the relationship between workplace conditions and mental health outcomes and satisfaction.

A key observation from the results was the finding that perceived stress mediated the relationship between work demands and resources and outcomes. While these effects were largely partial (although full mediating effects were found between job demands and depression, and extrinsic effort and satisfaction in a sample of university employees) it is still an important finding that how people feel about the stressful (or not stressful) nature of their work environment, can be just as important a pathway towards health outcomes, as is the direct perceived effect of those work environments. This finding also supports the work of many authors, such as Payne, Jick, and Burke (1982) and Briner et al. (2004) who state that subjective perceptions of the stressful nature of work environments, rather than just the nature of those environments themselves, must be taken into account. Similarly, a key finding was that personal characteristics had main effects on health outcomes, and had moderating effects on the relationship between workplace demands/resources and health outcomes.

The supporting of many aspects of the model shown in figure 2 provides a good basis for the development of future research. Different organisational and personal variables could easily be inserted into the framework and tested, and such research could provide more information on the relative importance of different variables in the prediction of outcomes, and more information about how they may interact. Such research may provide support for the structure of the proposed model, or could be used to revise the model. Longitudinal research could be particularly useful to see if such a model has any predictive validity.

SUMMARY AND CONCLUSIONS

The purpose of this chapter was to outline some of the main issues associated with increasing levels of work-related stress in our society, and the growing awareness of what this may mean for the health of employees, and the economic costs to employers and the UK economy. A brief summary of many of the key models relating to work-related stress was carried out, including a consideration of some of their pros and cons, and common features. It was suggested that many models have failed to include a role for the important effect of subjective perceptions and individual differences (despite some good predictive validity) or otherwise are complex, hard to support, and lack predictive validity. On the basis of these issues a new model was proposed which attempts to combine features of existing models, including roles for psychosocial job characteristics and individual differences, framed in terms of demands and resources, and to represent the complexities of the stress process, without making hypotheses about the specific details of mental processes. Some supporting research was described, and a key aspect was the inclusion of a subjective perception of job stress variable (included in response to the oversimplification assumption) which predicted health outcomes in some circumstances as well as job characteristics.

It is suggested that the DRIVE model as shown in figure 2, strikes a good balance between integration of aspects of job characteristics models such as the DCS, as well as aspects from the ERI model, and important developments from transactional stress models, while still maintaining a balance between simplicity and complexity. If more data could be provided for the development and support of models such as the DRIVE model, such frameworks could provide a useful guide for organisational interventions, by showing how alteration of one aspect of the model may affect other parts of it, and to help co-ordinate single or multi-level interventions that focus on one or more of primary, secondary, and tertiary levels – something that models that focus only on job characteristics may be limited in their ability to do.

REFERENCES

- Arnold, J., Cooper, C. L., & Robertson, I. T. (1995). *Work psychology. Understanding human behaviour in the workplace* (2nd ed.). London: Pitman Publishing.

- Bakker, A.B., Demerouti, E., Euwema, M.C. (2005). Job resources buffer the impact of job demands on burnout. *Journal of Occupational Health Psychology*, 10, 170-80.
- Baron, R. M., & Kenny, D.A. (1986). The Mediator-Moderator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*, 51, 6, 1173-1182.
- Bosma, H., Peter, R., Siegrist, J., and Marmot, M.G. (1998). Alternative job stress models and the risk of coronary heart disease. *American Journal of Public Health*, 88, 68-74.
- Brief, A.P., & George, I.M. (1991). Psychological stress and the workplace: A brief comment on Lazarus' outlook. In P.L. Perrewe (Ed.), *Handbook on job stress*. *Journal of Social Behaviour and Personality*, 6 (7), 15-20.
- Briner, R.B., Harris, C., & Daniels, K. (2004). How do work stress and coping work? Toward a fundamental theoretical reappraisal. *British Journal of Guidance & Counselling*, 32, 2, 223-234.
- Buunk, B. P., de Jonge, J., Ybema, J.F., & de Wolff, C.J. (1991). Psychosocial Aspects of Occupational Stress. In P.J.D. Drenth, H. Thierry & C.J. de Wolff (Eds.), *Handbook of Work and Organizational Psychology*, 145-182.
- Caplan, R.D., Cobb, S., French, J.R., Harrison, R.D. & Pinneau, S.R. (1975). *Job Demands and Worker Health: Main effects and occupational differences*. Washington: U.S. Government Printing Office.
- Carayon, P. (1993). Effect of electronic performance monitoring on job design and worker stress: Review of the literature and conceptual model. *Human Factors*, 35, 385-95.
- Cooper, C. L., Dewe, P.J., & O'Driscoll, M.P. (2001). *Organizational Stress: A Review and Critique of Theory, Research, and Applications*. Sage Publications.
- Cox, T. (1987). Stress, coping and problem solving. *Work & Stress*, 1, 5-14.
- Cox, T., & Ferguson, E. (1991). Individual Differences, Stress and Coping. In C.L. Cooper, & R. Payne (Eds.). *Personality and Stress: Individual Differences in the Stress Process*. Wiley.
- Cox, T. & Griffiths, A. (1995). The nature and measurement of work stress: theory and practice. In J.R. Wilson & E.N. Corlett (Eds.), *Evaluation of human work: a practical ergonomics methodology*, London: Taylor & Francis.
- Cox, T., Griffiths, A. & Rial-Gonzalez, E. (2000). *Research on Work-Related Stress*, Office for Official Publications of the European Communities: Luxembourg.
- Cox, T. & Mackay, C.J. (1981). A Transactional approach to occupational stress. In E.N. Corlett and J. Richardson (Eds.), *Stress, Work Design and Productivity*. Chichester: Wiley & Sons.

- de Jonge, J., Bosma, H., Peter, R. & Siegrist, J. (2000). Job strain, effort-reward imbalance and employee well-being: a large-scale cross-sectional study, *Social Science and Medicine*, 50, 1317-1327.
- de Jonge, J., & Dormann, C. (2003). The DISC model: Demand-induced strain compensation mechanisms in job stress. In M. F. Dollard, H. R. Winefield, & A. H. Winefield (Eds.), *Occupational stress in the service professions*, 43-74. London: Taylor & Francis.
- Demerouti, E., Bakker, A.B., Nachreiner, F. & Schaufeli, W.B. (2001). The job demands-resources model of burnout, *Journal of Applied Psychology*, 86, 499-512.
- Dewe, P. (1991). Primary Appraisal, secondary appraisal and coping: their role in stressful work encounter, *Journal of Occupational Psychology*, 64, 331-351.
- Dewe, P., & Trenberth, L. (2004). Work stress and coping: drawing together theory and practice, *British journal of guidance & counselling*, 32, 143-156.
- Earnshaw, J. & Cooper, C. L. (1994). Employee stress litigation: The UK experience. *Work and Stress*, 8, 287-295
- Falkum, E., Olff, M., & Aasland, O.G. (1997) Revisiting the factor structure of the ways of coping checklist: a three-dimensional view of the problem-focused coping scale. A study among Norwegian physicians. *Personality and Individual Differences*, 22, 257-267.
- Florio, G. A., Donnelly, J.P. & Zevon, M.A (1998). The Structure of Work-Related Stress and Coping Among Oncology Nurses in High-Stress Medical Settings: A transactional Analysis, *Journal of Occupational Health Psychology*, 3, 227-242.
- Folkman, S. (1984). Personal control and stress and coping processes: A theoretical analysis, *Journal of Personality and Social Psychology*, 46, 839-852.
- Folkman, S., & Lazarus, R.S. (1980). An Analysis of coping in a Middle-Aged Community sample. *Journal of Health and Social Behaviour*, 21, 219-239.
- Folkman, S., Lazarus, R.S., Gruen, R.J., & DeLongis, A. (1986). Appraisal, Coping, Health Status, & Psychological Symptoms, *Journal of Personality and Social Psychology*, 50, 571-579.
- French, J.R.P. Jr. (1973). Person-role fit, *Occupational Mental Health*, 3, 15-20.
- French, J.R.P. Jr, Caplan, R.D., & Harrison, R.V. (1982). *The mechanisms of job stress and strain*. London: Wiley.
- Frese, M., & Zapf, D. (1999). On the Importance of the objective environment in stress and attribution theory. Counterpoint to Perrewe and Zellars, *Journal of Organizational Behavior*, 20, 761-765.
- Gabriel, P. (2000). *Mental Health in the Workplace*, International Labour Office, Geneva.

- Gianakos, I. (2002). Predictors of Coping with Work Stress: The Influences of sex, gender role, social desirability, and locus of control, *Sex Roles*, 46, 149-158.
- Goetzel, R.Z., Anderson, D.R., Whitmer, R.W., Ozminkowski, R.J., Dunn, R.L. & Wasserman J, (1998). The relationship between modifiable health risks and health care expenditures, *Journal of Occupational and Environmental Medicine*, 40, 843-854.
- Griffiths, A. (1998). The psychosocial work environment. In R. C. McCaig and M. J. Harrington (Eds.) *The changing nature of occupational health*, 213-232.
- Hackman, J. R., & Oldham, G. R. (1980). *Work Redesign*, Reading, MA: Addison-Wesley.
- Haghighatgou H. & Peterson C. (1995). Coping and depressive symptoms among Iranian students, *Journal of Social Psychology*, 135, 175-80.
- Health and Safety Executive (2007). *Workplace Stress Costs Great Britain in Excess of £530 million*, Retrieved, March 2008, from, <http://www.hse.gov.uk/press/2007/c07021.htm>
- Health and Safety Executive (2007). *Managing the risk factors of work-related stress in Home Office headquarters and the Border and Immigration Agency*, Retrieved, March 2008, from, <http://www.homeoffice.gov.uk/hons/white-hon/hon041-2007.pdf?view=Binary>
- Health and Safety Executive (2007). *HSE Management standards indicator tool*, Retrieved, June 2008, from, <http://www.hse.gov.uk/stress/standards/pdfs/indicatortool.pdf>
- Hodgson, J.T., Jones, J. R., Elliot, R.C. & Osman, J. (1993). *Self-reported Work-related Illness: Results from a Trailer Questionnaire on the 1990 Labour Force Survey in England and Wales*. Sudbury: HSE Books.
- Huang, G.D., Feurstein, M., & Sauter, S.L. (2002). Occupational Stress and Work-Related Upper Extremity Disorders: Concepts and Models, *American Journal of Industrial Medicine*, 41, 298-314.
- Hurrell, J. J. & McLaney, M. A. (1988). Exposure to job stress – A new psychometric instrument, *Scandinavian Journal of Work Environment and Health*, 14, 27-28.
- Jick, T. D. & Mitz, L.F. (1985). Sex Differences in Work Stress, *Academy of Management Review*, 10, 408-420.
- Johnson, J.V., Hall, E.M. (1988). Job strain, workplace social support and cardiovascular disease: a cross-sectional study of a random sample of Swedish working population, *American Journal of Public Health*, 78, 1336-42.
- Jones, M., Smith, K. & Johnston, D. (2005). Exploring the Michigan model: The relationship of personality, managerial support and organizational structure with health outcomes in entrants to the healthcare environment, *Work & Stress*, 19, 1-22.

- Jose, P.E. (2004). Medgraph. www.victoria.ac.nz/psyc/staff/paul-jose/files/medgraph/download.php.
- Karasek, R. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign, *Administrative Science Quarterly*, 24, 285-306.
- Karasek, R.A. (1998). Demand/Control Model: a social, emotional, and physiological approach to stress risk and active behaviour development, In J. Stellman (Ed.). *Encyclopaedia of Occupational Health and Safety*. Geneva: International Labour Office, 34.6-34.14.
- Karasek, R. & Theorell, T. (1990). *Healthy work: Stress, productivity and the reconstruction of working life*, New York: Basic Books.
- Kompier, M. (2003). Job Design and Well-being. In M. Schabracq, J. Winnubst & C.L. Cooper, (Eds.), *Handbook of Work and Health Psychology*, 429-454.
- Kristensen, T.S. (1995). The demand-control-support model: Methodological challenges for future research, *Stress Medicine*, 11, 17-26.
- Kuper, H., Singh-Manoux, A., Siegrist, J. & Marmot, M. (2002) When reciprocity fails: Effort-reward imbalance in relation to coronary heart disease and health functioning within the Whitehall II Study, *Occupational and Environmental Medicine*, 59, 777-784.
- Lazarus, R.S. & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Lazarus, R.S. (1991). Psychological Stress in the Workplace. In P.L. Perrewe (Ed.). *Handbook on job stress*, *Journal of Social Behavior and Personality*, 6, 1-13.
- Lease, S. H. (1999). Occupational role stressors, coping, support, and hardiness as predictors of strain in academic faculty: An emphasis on new and female faculty, *Research in Higher Education*, 40, 285-307.
- Lewin, K. (1951). *Field theory in social science; selected theoretical papers*. New York: Harper & Row.
- Lim, V.K.G. (1996). Job insecurity and its outcomes-moderating effects of work-based and non-work based social support, *Human Relations*, 49, 171-194.
- Llorens, S., Bakker, A.B., Schaufeli, W., Salanova, M. (2006). Testing the robustness of the job demands-resources model. *International Journal of Stress Management*. 13, 378-391.
- Long, B.C., Kahn, S.E. & Schutz, R.W. (1992). Causal Model of stress and coping: Women in Management, *Journal of Counselling Psychology*, 39, 227-239.
- Mark, G.M. (2008, in preparation). The relationship between workplace stress and job characteristics, individual differences, and mental health.
- Parkes, K.R. (1989). Personal control in an occupational context, In A.

- Stephoe, & A. Appels (Eds.), *Stress, personal control and health*, 21-48. Chichester, England: Wiley.
- Parkes, K. (1994). Personality and coping as moderators of work stress processes: models, methods and measures, *Work & Stress*, 8, 110-129.
- Payne, R. (1988). *Individual Differences in the Study of Occupational Stress*, New York: Wiley.
- Park, C.L. & Folkman, S. (1997). Meaning in the context of stress and coping, *Review of General Psychology*, 2, 115-144.
- Payne, R.A., Jick, T.D. & Burke, R.J. (1982). Wither stress research?: An agenda for the 1980's. *Journal of Occupational Behaviour*, 3, 131-145.
- Perrewe, P.L., & Zellars, K.L. (1999). An examination of attributions and emotions in the transactional approach to the organizational stress process, *Journal of Organizational Behavior*, 20, 739-752.
- Peter R. & Siegrist J. (1999). Chronic psychosocial stress at work and cardiovascular disease: the role of effort-reward imbalance, *International Journal of Law and Psychiatry*, 22, 441-449.
- Rydstedt, L.W., Devereaux, J. & Sverke, M. (2007). Comparing and combining the demand-control support model and the effort-reward imbalance model to predict long-term mental strain, *European Journal of Work and Organizational Psychology*, 3, 261-278.
- Schabracq, M.J. & Cooper, C.L. (2000). The changing nature of work and stress, *Journal of Managerial Psychology*, 3, 227-241.
- Schaubroeck, J. (1999). Should the subjective be the objective? On Studying mental processes, coping behaviour, and actual exposures in organizational stress research, *Journal of Organizational Behavior*, 20, 753-760.
- Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions, *Journal of Occupational Health Psychology*, 1, 27-41.
- Siegrist J, & Peter, R. (2000). The effort-reward imbalance model. The workplace and cardiovascular disease, *Occupational Medicine: State of the Art Reviews*, 15, 83-87.
- Siegrist J., Peter R., Junge, A., Cremer, P. & Seidel, D. (1990). Low status control, high effort at work and ischemic heart disease: Prospective evidence from blue-collar men, *Social Science and Medicine*, 31, 1127-34.
- Siegrist, J., Starke, D., Chandola, T., Godin, I., Marmot, M., Niedhammer, I. & Peter, R. (2004). The measurement of effort-reward imbalance at work: European Comparisons, *Social Science & Medicine*, 58, 1483-1499.
- Smith, A., Johal, S.S., Wadsworth, E., Davey Smith, G., & Peters, T. (2000). The Scale of Occupational Stress: the Bristol Stress and Health at Work Study. *HSE Books. Report 265/2000*.

- Sonnentag, S. & Frese, M. (2003). Stress in Organisations. In W.C. Borman, D.R. Ilgen & R.J. Klimoski (Eds.), *Comprehensive handbook of psychology*. Hoboken, NJ: Wiley.
- Spector, P.E. (1982). Behavior in organisations as a function of employee locus of control, *Psychological Bulletin*, 91, 482 – 497.
- Spector, P.E. (2003). Individual differences in health and well-being in organisations, In D.A. Hoffman L.E. Tetrick (eds). *Health and Safety in Organisations: A Multilevel Perspective*. in the Society of Industrial and Organizational Psychology. San Francisco, CA: Jossey- Bass, Inc.
- Tennant, C. (2001). Work Related Stress and Depressive Disorders. *Journal of Psychosomatic Research*, 51, 697-704.
- Tong, E.M.W., Bishop, G.D., Diong, S.M., Enkelmann, H.C., Why, Y.P., Ang, J. & Khader, M. (2004). Social support and personality among male police officers in Singapore, *Personality and Individual Differences*, 36, 109-123.
- Van der Doef, M. & Maes, S. (1998). The Job Demand-Control (-Support) Model and physical health outcomes: a review of the strain and buffer hypotheses, *Psychology and Health*, 13, 909-936.
- Van der Doef, M. & Maes, S. (1999). The Job-Demand (-Support) Model and psychological well-being: a review of 20 years of empirical research, *Work & Stress*, 13, 87-114.
- Van Vegchel, N., de Jonge, J., Bakker, A.B. & Schaufeli, W.B. (2002). Testing global and specific indicators of rewards in the Effort-Reward Imbalance Model: Does it make any difference? *European Journal of Work and Organizational Psychology*, 11, 403-421.
- Van Vegchel, N., de Jonge, J., Bosma, H. & Schaufeli, W.B. (2005). Reviewing the effort-reward imbalance model: drawing up the balance of 45 empirical studies, *Social Science & Medicine*, 60, 1117-1131.
- Van Veldhoven, M., de Jonge, J., Broersen, S., Kompier, M. & Meijman, T. (2002). Specific relationships between psychosocial job conditions and job-related stress: A three level analytical approach, *Work & Stress*, 16, 207-228.
- Veldhoven, M. van, Taris, T.W., Jonge, J. de & Broersen, S. (2005). The relationship between work characteristics and employee health and well-being: how much complexity do we really need? *International Journal of Stress Management*, 12, 3-28.
- Vitaliano, P.P., Russo, J., Carr, J.E., Maiuro, R.D. & Becker, J. (1985). The Ways of Coping Checklist Psychometric Properties, *Multivariate Behavioral Research*, 20, 3-26.
- Wang, J. & Patten, S.B. (2001). Perceived work stress and major depression in the Canadian employed population, 20-49 years old, *Journal of Occupational Health Psychology*, 6, 283-289.
- Warr, P.B. (1987). *Work, unemployment, and mental health*. Oxford: Clarendon Press.

- Warr, P.B. (1990). Decision latitude, job demands, and employee well-being, *Work and Stress*, 4, 285–294.
- Welbourne, J.L., Eggerth, D., Hartley, T.A., Andrew, M.E. & Sanchez, F. (2007). Coping strategies in the workplace: Relationships with attributional style and job satisfaction, *Journal of Vocational Behavior*, 70, 312-325.
- Xanthopoulou, D., Bakker, A. B., Demerouti, E. & Schaufeli, W. B. (2007). The role of personal resources in the job demands-resources model, *International Journal of Stress Management*, 14, 121–141.
- Zeidner, M. (1994). Personal and Contextual Determinants of Coping and Anxiety in an Evaluative Situation: A Prospective Study, *Personality and Individual Differences*, 16, 899-918.