Southeast Asia Psychology Journal
Vol 1 (2012) 10-21
http://www.cseap.edu.my/sapj

Review of the Job Demand-Control and Job Demand-Control-Support models: Elusive moderating predictor effects and cultural implications

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A B S T R A C T

The Job Demand-Control (JDC) and Job Demand-Control-Support (JDCS) models are among the most widely used theoretical frameworks that relate the characteristics of a job to health and wellbeing. The purpose of this paper is to review studies on these models, which are well recognised job stress theories in western cultural settings. Generally, the review finds that psychosocial work environment variables of high job demands, low job control and low social support are consistently associated with workers' high strain or low wellbeing. However, two-way and three-way interactive predictors reveal contradictory findings and moderating hypotheses receive modest support from the literature. The review provides insights into the need for further investigation of these models in different cultural settings, such as the collectivist culture of Malaysia, to further understanding of the cross-cultural applications of JDC and JDCS models.

ARTICLE INFO

Southeast Asia Psychology Journal Classification Codes
1010
4130

Keywords:
Job Demand Control (JDC) model
Job Demand-Control-Support (JDCS) model
worker wellbeing

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1. Introduction

In the workplace, employees are the most valuable asset of an organisation. Their dissatisfaction with their job or life will significantly affect their commitment and dedication to their work, family and employer. Hausser, Mojzisch, Niesel and Schulz-Hardt (2010) point out that one of the current interests of organisational psychology is the relationship between job characteristics and psychological wellbeing. The Job Demand-Control (JDC) (Karasek, 1979) and Job Demand-Control-Support (JDCS) (Johnson & Hall, 1988; Karasek & Theorell, 1990) models are the most widely used theoretical frameworks that relate the characteristics of a job to health and wellbeing.

This article aims to review studies on the JDC and JDCS models, with particular focus on presenting findings related to the additive, and the two-way and three-way interactive predictor moderating effects. Overall, it is observed that findings on the independent main and additive predictor effects with regard to JDCS models are more conclusive than the findings on the moderating effects of the two-way and three-way interactive predictors on job strain and worker wellbeing. In addition, the review provides an overview of these models which are established in the western culture but suggests further investigation to establish applicability and generalizability of these models to the non-Western cultures.

Job Demand-Control and Job Demand-Control-Support models

JDC provides crucial determinants of work-related wellbeing and health, and has been the influential work stress model in occupational health psychology since the 1980s (De Lange, Taris, Kompier, Houtman & Bonger, 2003; Lindfors et al., 2007). This model identifies two essential aspects of work environments: job demand and job control.

According to Karasek (1979) job demands are: the psychological stressors involved in accomplishing the workload, stressors related to unexpected tasks, and stressors of job-related personal conflict (p. 291)….

Job control, also referred to as decision latitude, is defined as a:
working individual's potential control over his task and his conduct during the working day (pp. 289-290).

Karasek's (1979) concept of decision latitude was composed of two constructs: decision authority, referring to employees' authority to make job-related decisions; and skill discretion, measuring the extent of skill that employees use on the job. In a later study, Jones and Fletcher (1996) defined job demands as the physical, psychological, social, or organisational aspects of jobs that require physical and/or psychological effort, and are associated with physiological and/or psychological costs.

Figure 1 summarises the four types of jobs identified in Karasek's model. The dichotomy of job demands and job control produces: a) for the high strain job type- high job demands and low job control; b) for the active job type - high job demands and high job control; c) for the low strain job type – low job demands and high job control; and d) for the passive job type – low job demands and low job control. Karasek's Job Demand-Control model (1979) hypothesised that a combination of high job demands and low job control produced job strain. The most negative impact of psychological strain was found to be among employees working with high job demands and low job control (high strain job). This postulation was known as the strain hypothesis.

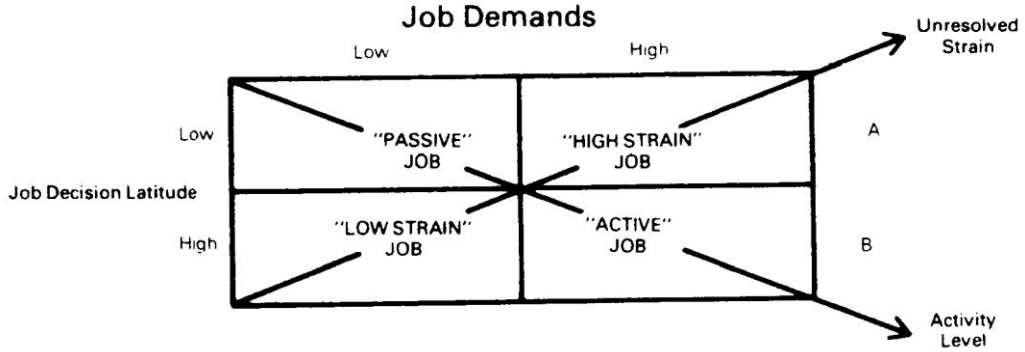

Figure 1. The Job Demand-Control model (Karasek, 1979)

In addition to the independent and additive contribution of job demands and job control in predicting wellbeing, the JDC model also postulated the buffer hypothesis (an interactive joint effect of job demands and job control) in which job control can moderate the negative consequences of high job demands on wellbeing. The model also includes the learning hypothesis which posits that the passive or active nature of a job can influence an employee's learning or growth. Employees who possessed high demands and control in their work environment (active jobs) became very productive and acquired new skills (Karasek, 1979). The passive job type was characterised as the job condition where employees experienced both low job control and low demands. Employees in this group faced difficulty in problem solving or tackling challenges and were unmotivated to participate in overall activities. However, numerous studies apply the JDC and JDCS models to test the strain hypothesis (e.g. Macklin, Smith & Dollard, 2006; Van Yperen & Hagedoorn, 2003) rather than learning hypothesis. This review focusses exclusively on research literature on the strain hypothesis.

Johnson (1986) argued that the JDC model mainly focused on job control as a potential psychosocial resource without considering social support which is as important as job control as a moderator. Thus, in 1988, it was proposed that Karasek's model be extended by the addition of social support as a third dimension. In the Job Demand-Control-Support model developed by Johnson and Hall (1988), the highest risk of poor health and wellbeing is expected when employees experience a high isolation-strain (iso-strain) job, that is, a job characterised by high job demands, low job control and low social support.

Similar to the JDC, the JDCS model also predicts main, additive and interactive predictor effects. Main effect refers to a single predictor which has a positive or negative association with the criterion variable (e.g.,

high job demand is associated with low employee wellbeing, whereas high job control and social support are associated with high wellbeing). In other words, main predictor effects form the basis for testing multiple predictor models of JDC and JDCS models on worker wellbeing or job strain. For a prediction model with multiple predictors, the additive or the interactive predictor effects need to be examined (Bradley, 2004). Additive effect involves the evaluation of multiple predictors in the prediction model (e.g. job demands + job control or job demands + job control + social support contributing jointly to the prediction of employee wellbeing). For example, in a Hierarchical regression analysis, adding a predictor variable (e.g. job control) into the existing model (e.g job demands) demonstrates the extent of specific contribution of a predictor as the increase in the variance of the criterion variable accounted for by predictors. In this scenario, the predictors act conjunctively or cumulatively (Bradley, 2004, p.24), also referred as a linear additive effect, in predicting the criterion variable. The additive model implies that when employees experience high job demands + low job control + low social support, these factors combine additively but independently in predicting employee wellbeing (iso-strain hypothesis).

An interaction effect (synergistic effect) in the JDC model has been described as a joint interactive predictor contribution of job demands x job control (Karasek, 1989). The inclusion of social support (Johnson, 1986; Johnson & Hall, 1988) extends the JDC model, resulting in an additional joint interactive moderating (i.e., job demands x social support). According to Bradley, in a two-way interaction effect involving more than one predictor variable, one predictor acts as a moderator variable of another. In this review, the following two-way interaction is discussed: a) job control moderates the negative consequence of high job demands on wellbeing (job demands x job control); and b) social support moderates the negative consequence of high job demands on wellbeing (job demands x social support). These moderating effects are present when the interactive predictors (e.g. job demands x job control, or job demands x social support) statistically contribute to add to the variance explained by the additive prediction model (Aiken & West, 1991; Cohen, Cohen, West & Aiken, 1983; Jaccard, Turrisi & Wan, 1990).

Finally, a higher order interactive predictor effect can be observed when the joint interactive effect of three predictors (job demands x job control x social support) may improve prediction of the criterion variable above and beyond the variance explained by the additive prediction models and two-way interactive predictors. For example, social support may moderate the negative consequence of high job demands and low job control on wellbeing (job demands x job control x social support). In this condition, social support acts as a buffering or moderating variable against the negative consequences of high job strain (the buffer hypothesis).

Psychosocial Work Environment and Wellbeing

A report of the joint International Labor Organisation (ILO) in conjunction with the WHO Committee on Occupational Health defined psychosocial factors at work as:

> interactions between and among work environment, job content, organisational conditions and workers' capacities, needs, culture, personal extra-job considerations that may, through perceptions and experience, influence health, work performance and job satisfaction. (ILO, 1984, p.3)

Growing numbers of studies have revealed that social supports such as advice, assistance and feedback have a strong relationship with employees' wellbeing and lack of stress (Beehr, King & King 1990; Fujishiro, 2005; Leong, Furham & Cooper, 1996). In their study, Karasek and Theorell (1990) defined social support at work as "overall levels of helpful social interaction available on the job from co-workers and supervisors" (p. 69). Social support gained from supervisors and senior personnel who were experienced in dealing with work-related issues was found to be particularly helpful (Beehr et al., 1990). The support provided by co-workers was found to take different forms in the workplace, including emotional and instrumental supports (Beehr, Jex, Stacy & Murray, 2000; Ducharme & Martin, 2000). Researchers have found that emotional support consists of providing care, empathy and love, demonstrated in ways such as by listening to others' personal problems. Instrumental support refers to tangible help that co-workers may provide, by for example, performing assigned tasks for others. In this sense, co-workers constitute an important source of support, especially when task accomplishment allows employees to interact with their co-workers (Parris, 2003). This was further confirmed in a study by Park, Wilson and Lee (2004), which found that social support in organisational settings in the form of organisational, supervisor and co-worker supports is essential to wellbeing.

The following section reviews previous studies on the JDC and JDCS models by focusing on main, additive and interaction effects of JDCS variables. Typically, hierarchical multiple regression analyses are most widely used to test the JDC and JDCS models (e.g. Macklin, Smith & Dollard 2006; Niedhammer, Chasting & David, 2008; Pomaki & Anagnostopoulou, 2003).

Main and Additive Effects of JDCS Variables and Wellbeing

Reviews of studies conducted in three different phases by Van der Doef and Maes (1999) for the years 1979 to 1997, De Lange, Taris, Kompier, Houtman and Bongers (2003) for 1979 to 2000, and Hausser, Mojzisch, Niesel and Schulz-Hardt (2010) for 1998 to 2007, generally report consistent findings regarding strain and iso-strain hypotheses of the JDC and JDCS models. The strain hypothesis of the JDC model postulates that individuals experienced high strain and low levels of wellbeing whenever working with high job demands and low job control (Karasek, 1979). The JDCS model postulates the iso-strain hypothesis in which employees experience the job strain and low levels of wellbeing whenever working with high job demands, low job control and low social support. Evidence shows that job demands, job control and social support create the main and additive effects on strain and wellbeing (De Lange et al., 2003; Hausser et al., 2010; Van der Doef & Maes, 1999).

A review of 20 years of empirical research using Karasek's model confirmed that high demand and low control work environments are associated with lower psychological wellbeing and job satisfaction, burnout and other forms of psychological distress (Van der Doef & Maes, 1999), and significantly impact on employee wellbeing (Noblet, 2003). An early study by Marshall, Barnett and Sayer (1997) involving 600 manufacturing and services industries in the United States found that job demands significantly affect workers' psychological distress. Some studies investigated the main and additive effects of JDCS variables and found that job demands, job control and social support were statistically predictive for wellbeing, reports of health risk, levels of psychological wellbeing, job satisfaction and fatigue (Chambel & Curral, 2005; Macklin, Smith & Dollard, 2006; Niedhammer, Chastang & David, 2008; Pelfrene et al., 2002; Rodriguez, Bravo, Peiro & Schaufeli, 2001; Van Yperen & Hagedoorn, 2003). In an experimental study involving 120 undergraduate students in Australia, Searle, Bright and Bochner (1999) found that job demands and social support have a significant main effect on stress and performance. These students showed poorer performance in conditions of high job demands and low control. Jobs that required psychological demands and low social support have also been found to have a negative impact on employee mental health, vitality and burnout (Escriba-Aguir & Tenias-Burillo, 2004) and job satisfaction (Huda et al., 2004). These jobs are also positively associated with anxiety, stress and depression (Edimansyah, et al., 2008).

Likewise, de Rijk, Le Blanc and Schaufeli (1998) investigated Karasek's hypothesis using a sample of 367 Dutch nurses and reported the main and additive effects of high job demands and low job control on workers' burnout. Escriba-Aguir and Tenias-Burillo (2004) found that low job control and low co-worker support were associated with poor psychological wellbeing. Meanwhile, among hospital workers and non-permanent employees it was found that involvement in high workload and psychological job demands, low decision authority and skill discretion (low job control) were related to minor psychiatric morbidity, self-reported health problems and higher absenteeism (Kivimaki, Elovainio, Vahtera & Ferrie, 2003; Gimeno, Benavides, Amick III, Benach & Martinez, 2004). Brough and Pears (2004), in their study of 205 public sector human services workers, found that job demands were significantly associated with lower job satisfaction and work wellbeing and job control increased the outcomes.

On the other hand, no association was found between job control and psychological distress (Marshall et al., 1997), between job control and stress (Searle et al., 1999) and between job control and workers' stress, anxiety and depression Edimansyah et al. (2008).

Previous research findings into the role of social support on positive outcomes of employee wellbeing have been inconsistent and contradictory. For example, social support has been found to be associated with increased absenteeism among 10,308 non-industrial civil servants in London (Rael, Stansfeld, Shipley & Head, 1995). In later works, neither Pomaki and Anagnostopoulou (2003) nor Rasku and Kinnunnen (2003) revealed that social support was a significant predictor of wellness and health outcomes in Greek and Finnish teachers, respectively.

In contrast, supervisor support was found to increase the level of respondents' intrinsic motivation (Van Yperen & Hagedoorn, 2003), to increase performance (Bhanthumnavin, 2003), to have strong associations with job satisfaction (Brough & Pears, 2004) and contribute to employees' psychological wellbeing (Gilbreath & Benson, 2004). Conversely, low social support was found to lead to severe outcomes for employees' psychological wellbeing (Escriba-Aguir & Tenias-Burillo, 2004). These findings have been supported by other researchers who established the importance of social support in enhancing employee wellbeing as a protective factor against depression and stress (Netterstrom et al., 2008). For example, Edimansyah et al. (2008) found that social support at the workplace predicted higher perceptions of quality of life among 698 male automotive workers in Malaysia. Similarly, Chen, Siu, Lu, Cooper and Phillips (2009) in their research involving 843 employees in eight types of domestic and foreign-invested enterprises in China, found that informal social support decreased depression.

In reviewing the literature, it is found that the main effect of JDCS variables on wellbeing is substantially supported and that a clear relationship is established between those variables with outcomes measured. However, the job demands x job control interaction is inconclusive, receiving only modest support (Chay, 1993; Van der Doef & Maes, 1999). Besides the inconsistencies in the literature regarding the moderating effect of job control, previous studies have indicated inconsistencies in the moderating effects of social support on wellbeing, work stress and occupational stress (Van der Doef & Maes, 1999; Dormann & Zapf, 2002; Brough & Pears, 2004).

Two-way and Three-way Interaction Effect of JDC and JDCS Variables

In addition to the strain and iso-strain hypotheses, Karasek (1979) and Johnson and Hall (1988) postulated a buffering hypothesis which tested two-way interaction effects (job demands x job control and job demands x social support) as well as three-way interaction effects (job demands x job control x social support). However, in contrast to the findings on the main and additive effects of job demands, job control and social support findings, significant two-way interaction findings receive modest support (De Lange et al., 2003; Hausser et al., 2010; Van der Doef & Maes, 1999).

Moderating Effects of Job Control on Job Demands and Well-being

Van der Doef and Maes (1999) report that out of 31 studies that examined the moderating effect of job control on the relationship between job demands and well-being, only fifteen partially supported the buffering hypothesis of the JDC model. For instance, similar to Pelfrene et al. (2002) who did not find evidence for buffering effect of job control on the relationship between job demands and psychological distress, neither Pomaki and Anagnostopoulou (2003) nor Rasku and Kinnunnen (2003) found buffering effect on teachers' wellness outcomes. Testing the buffer hypothesis of the JDC model, Niedhammer et al. (2008) also did not find evidence of the interaction between job demands x job control on health outcomes in self-reported health, sickness absence and work injury among French workers.

In contrast, other studies (e.g. Chambel & Curral, 2005; Macklin et al., 2003; Meier, Semmer, Elfering & Jacobshagen, 2008; Van Yperen & Hagedoorn, 2003) support the buffer hypothesis that job control buffers the demands and strain/well-being relationship. For example, Van Yperen and Hagedoorn's (2003) study involving 555 nurses in the United States found an interactive joint effect of job demands x job control on workers' fatigue, in which job control ameliorated the high psychological job demands and fatigue relationship. The study by Chambel and Curral (2005) involving 825 Portuguese university students also found a significant effect of two-way interaction in which job control mitigates the relationship between job demands and anxiety/depression. In a later study, Meier et al. (2008) found that job control buffered the negative effect of stressors on health and wellbeing among 96 Swiss employees exhibiting internal locus of control.

Moderating Effects of Social Support on Job Demands and Well-being

According to Van der Doef and Maes (1999) due to the limited and inconsistent results on the role of social support in the JDCS buffer hypothesis, further investigation should be undertaken. A few studies have shown positive results on the moderating effects of social support, but other studies have not. For example, a survey by Beehr et al. (1990) conducted among 225 nurses in the United States, showed that social support

buffers the relationship between occupational stressors and individual strain. In addition, Chay's (1993) study involving 117 entrepreneurs confirmed that the protective role of social support in the workplace has a strong buffering effect that mitigates stressors and enhances physical and psychological well-being. In that study, individuals with high social support were little affected by low job discretion, while those with low support showed more psychological illness. Similarly, Chen et al. (2009) found that informal social support partially moderated the relationship between job stressors and depression.

Conversely, in a study of 119 two-career couples, Parasuraman, Greenhaus and Granrose (1992) established that social support did not mitigate the relationship between work role stressors, work family conflict and family role stressors, and well-being. Furthermore, social support buffers neither the relationship between job strain and psychological distress nor the negative effect of job characteristics on respondents' wellness (Pelfrene et al., 2002; Pomaki & Anagnostopoulou, 2003; Rasku & Kinnunnen, 2003). Fujishiro (2005) also found that social support provides no moderating effect between stressors (i.e., role conflict and workload) and job strain and psychological wellbeing.

Cultural differences might contribute to the inconsistencies in the findings of these studies. Barak, Findler and Wind (2003) state that the structures of social support networks may vary from one culture to another. By taking into account Hofstede's dimensions of cultural differences based on nationality (power distance, individualism-collectivism, femininity-masculinity and uncertainty-avoidance) ("Geert Hofstede cultural dimensions," 2009), the current review suggests the need for further investigation of social support in the Malaysian context, an example of collectivist culture (Bochner, 1994; Burns & Brady, 1992). Barak et al.'s (2003) study involving 950 workers in the United States (individualistic culture) and 114 workers in Israel (collectivistic culture) found that the structure of the social support network for the Israeli workers was highly interconnected compared to the social support network for the workers in the United States. In the collectivist society, supports from supervisors, colleagues and co-workers are likely to contribute more towards individuals' wellbeing than other individualistic values (e.g., job satisfaction).

As well as differences in cultural background, it is possible that the inconsistencies in the findings were due to different foci on the sources of social support (supervisors, co-workers, family, friends and neighbours). For example, Beehr et al. (1990) focussed on support from supervisor rather than from co-workers or others. In their study, social support was operationalised in terms of communications between supervisors and subordinates. Salient effects were found when non-job related communication acted as the moderator. Meanwhile, a study by Parasuraman et al. (1992) assessed both work and spousal support. They used House's (1981) questionnaire, in which respondents rated the same items measuring different sources of support. It is possible that respondents perceived their support as coming from only one source, either work or spouse, when answering the questionnaires. In a later study, Chen et al. (2009) used seven items of social support developed by Xiao (1994) to measure support given by: family including spouse, siblings and relatives; friends; neighbours; and co-workers. Support was measured in terms of objective support (e.g. "When you encounter problems, do you receive comfort and concern from spouse, friends, neighbours or co-workers?") and subjective support (e.g. "How many close friends that you can receive support and care?").

Three-way Interaction Effect of Job Demands, Job Control and Social support

With regard to the three-way interaction effect, a review of the literature reveals inconsistent findings (e.g. Chambel & Curral, 2005; Pomaki & Anagnostoloulou, 2003; Rasku & Kinnunnen, 2003; Rodriguez et al., 2001; Searle et al., 1999). For example, Van Yperen and Hagedoorn (2003) reported a significant three-way interaction (job demands x job control x social support) on employees' intrinsic motivation. The interpretation of interaction showed that high job demands were associated with greater intrinsic motivation in a high control and low social support group, whereas high social support was associated with greater intrinsic motivation regardless of the level of job demands and job control.

Contrary to the prediction of the JDCS model, Rodriguez et al. (2001) found that the findings did not corroborate the assumption that low social support combined with low job control and high job demands is associated with increased job dissatisfaction. Contrary to the model prediction, increased job demands with increased job control (perceived job control and high internal locus of control), together with high social support are associated with higher job dissatisfaction. In this context, workers experienced a damaging effect of excess control specifically in high social support situations. Also relevant to testing three-way interaction is

the study by Macklin et al. (2006) which reported the insignificance of the joint interactive effect of job demands x job control x social support on employees' psychological distress and job satisfaction.

Criticism of the Job Demand-Control and Job Demand-Control-Support models

The JDC model as developed initially by Karasek was later enriched with the addition of social support by Johnson and Hall (1988). Yet studies have found limitations in both the JDC model (Karasek, 1979) and the JDCS model (Johnson & Hall, 1988; Karasek & Theorell, 1990). De Jonge and Kompier (1997) point out that a number of studies do not find the interactive effects of job demands, job control and social support. If the findings do reveal this effect, the results are statistically weak or do not occur in the predicted direction hypothesized by the JDCS model. Rodriguez, Bravo, Peiro and Schaufeli (2001) state that the inconsistencies of findings regarding the role of job control in moderating the impact of job demands on strain could be attributed to Karasek's model, which was seen as too simple. Dollard, Winefield, Winefield and de Jonge (2000) argue that previous studies on JDCS offer contradictory findings regarding the interactive effects of job demands x job control x social support due to the existence of curvilinear effects for one of these variables.

Loretto et al. (2005) and Spark and Cooper (1999) criticise the JDCS model (Johnson & Hall, 1988; Karasek & Theorell, 1990) for its overwhelming focus on the psychosocial work environment variables without considering the individual aspect or other job variables. In another study, Fujishiro's (2005) findings also corroborate the empirical supports for the limitation of interaction among job demands x job control x social support. However, in organisational studies, the JDC model remains the most crucial determinant of work-related wellbeing and health (Linfors et al., 2007) and the JDCS model is the most widely tested model of occupational stress (De Lange, Taris, Kompier, Houtman & Bongers, 2003).

Cross-cultural Perspectives on the JDC and JDCS Models

Verhoeven, Maes, Kraaij and Joekes (2003) recommend that studies testing the JDCS model be carried out in non-western settings. Most of the available findings represent data relevant to western settings, which raises concerns about the validity of the model in different cultural contexts. In addition, concepts such as job control and social support have different connotations in different countries among people of different cultural backgrounds (Verhoeven et al., 2003).

In the literature, only a few studies have adopted the JDC and JDCS models outside the western context. For instance, Higashiguchi et al. (2002) surveyed 8342 manufacturing workers in Japan. The results supported the main effect of job demand and control on depression. However, no interaction effect of job demands x job control was reported. Shimazu, Shimazu and Odahara (2004) surveyed 867 Japanese employees and found that job demands and social support have main and additive effects on job satisfaction. Incorporating active coping as the predictor variable which was measured with items such as "I took concrete action by myself" did not reveal any statistically significant effect on job satisfaction. However, the two-way interaction between active coping x co-worker support was significant, with a positive relationship between active coping and job satisfaction in a group of workers who perceived high levels of co-worker support. None of the three-way interactions was statistically significant.

A review of Edimansyah et al.'s (2008) study involving 728 automotive assembly workers in Malaysia, specifically on JDCS variables, shows that job demand was associated with self-perceived depression, anxiety and stress, whereas, supervisor support was associated with depression and stress. On the contrary, job control was not associated with any of the outcomes. The interaction effect of job demands x supervisor support was found to be insignificant.

On the contrary, the findings of Wong and Lin (2007) from a survey of 380 Taiwanese employees support the main and buffering effect hypotheses of the JDC and JDCS models. Job demands, job control and supervisor support were associated with work to leisure conflict. Job control and social support were found to buffer the negative consequence of high job demands on employees' perception of work to leisure conflict. In addition, a three-way interaction effect was also reported by their findings.

Instead of investigating the main, addictive and interaction effects of the JDC and JDCS models, some studies in eastern countries cultural settings have focused on psychometric evaluations of the translated

version of the Job Content Questionnaire (JCQ) (Karasek, 1985) and proved its applicability in different cultural settings. For example, studies have been carried out using a Chinese version (Cheng, Luh, Guo, 2003), Korean version (Eum et al., 2007), Malay version (Hadi, Naing, Daud & Nordin, 2006) and Thai version (Phakthongsuk, 2009).

Although three comprehensive reviews of JDC and JDCS studies (see De Lange et al., 2003; Hausser et al., 2010; Van der Doef & Maes, 1999) were consistent on the findings related to additive and buffer effects, most of the previous studies applying JDC and JDCS were conducted in western countries, namely: the US (e.g. Snyder, Krauss, Chen, Finlinson & Huang, 2008; Van Yperen & Hagedoorn, 2003); Australia (e.g. Macklin, Smith & Dollard, 2006; Searle, Bright & Bochner, 1999); and Europe (e.g. Pomaki & Anagnostopoulou, 2003; Rodriguez, Bravo & Peiro, 2001). A few studies have been conducted in eastern settings namely: Japan (Kawakami, Maratani & Araki, 1992; Shimazu, Shimazu & Odahara, 2004); Taiwan (Wong & Lin, 2007); and Malaysia (Edimansyah, 2008; Huda et al., 2004). A study by Xie (1996) reported that research adopting Karasek's model had been conducted in societies that matched Hofstede's category of individualist culture. Therefore, the generalisation of the model to a collectivist society would be limited.

Conclusion

In conclusion, a review of the JDC and JDCS literature generally reveals similar patterns regarding the main, addictive and interactive predictor contribution of JDC and JDCS variables. The current review demonstrates that psychological job demands, job control and social support are consistently found to be significant predictors of employee strain and wellbeing in psychosocial environment. However, the review also notes that more research is needed to further validate JDC and JDCS models in Asian culture. In particular, research in a collectivist culture, such as Malaysia, would provide useful information to further extend the applicability and generalizability of these models beyond the western society.

The research literature provides inconsistent modest support for moderating predictor effects. Although the support for the moderating effect is weak, further investigation may be necessary in collective settings rule out the buffering effects hypothesis. Such cross-cultural research would fill a gap in the literature and further validate the efficacy of the JDC and JDCS models. These minor limitations withstanding, both the JDC and JDCS models remain the most widely tested models for predicting employee strain and well-being.

References

Barak, M. E. M., Findler, L., & Wind, L. H. (2003). Corss-cultural aspects of diversity and well-being in the workplace: An international perspective *Journal of Social Work Research and Evaluation, 4*(2), 145-169.

Beehr, T. A., Jex, S. M., Stacy, B. A., & Murray, M. A. (2000). Work stressor and coworker support as predictors of individual strain and job performance. *Journal of Organizational Behavior, 21*, 391-405.

Beehr, T. A., King, L. A., & King, D. W. (1990). Social support and occupational stress: Talking to supervisors. *Journal of Vocational Behavior, 36*, 61-81.

Bhanthumnavin, D. (2003). Perceived Social Support from Supervisor and group Members' Psychological and Situational Characteristics as Predictors of Subordinate Performance in Thai Work Units. *Human Resource Development Quarterly, 14*(1), 79-97.

Bochner, S. (1994). Cross-Cultural Differences in the Self Concept: A test of Hofstede's Individualism/Collectivism Distinction. *Journal of Cross-Cultural Psychology, 25*, 273-283.

Bradley, G. (2004). *Job strain and healthy work in teachers: A test of the Demands-Control-Support Model.* Griffith University.

Brough, P., & Pears, J. (2004). Evaluating the influence of the type of socialsupport on job satisfaction and work related psychological well-being. *International Journal of Organisational Behaviour, 8*(2), 472-485.

Burns, D. J., & Brady, J. (1992). Cross-cultural comparison of the need for uniqueness in Malaysia and the United States. *Journal of Social Psychology, 132*, 487-495.

Chambel, M. J., & Curral, L. (2005). Stress in academic life: Work characteristics as predictors of student well-being and performance. *Applied Psychology: An International Review, 54*(1), 135-147.

Chay, Y. W. (1993). Social support, individual differences and well-being: A study of small business entrepreneurs and employees. *Journal of Occupational and Organizational Psychology, 66*, 285-302.

Chen, W.-Q., Siu, O.-L., Lu, J.-F., Cooper, C. L., & Phillips, D. R. (2009). Work stress and depression: the direct and moderating effects of informal sopcial support and coping. *Stress and Health, 25*, 431-443.

Cheng, Y., Luh, W.-M., & Guo, Y.-L. (2003). Reliability and validity of the Chinese version of the Job Content Questionnaire in Taiwanese workers. *International Journal of Behavioral Medicine, 10*(1), 15-30.

de Jonge, J., & Kompier, M. (1997). A critical examination of the Demand-Control-Support model from a work psychological perspective. *International Journal of Stress Management, 4*, 235-258.

Doef, M. V. D., & Maes, S. (1999). The job demand-control (-support) model and psychological well-being: a review of 20 years of empirical research. *Work and Stress, 13*, 87-114.

Dollard, M. F., Winefield, H. R., Winefield, A. H., & Jonge, J. d. (2000). Psychosocial job starin and productivity in human service workers: A tests of the Demand-COntrol-Support Model. *Journal of Occupational and Organizational Psychology, 73*(4), 501-510.

Dormann, C., & Zapf, D. (2002). Social stressors at work, irritation and depression: Accounting for unmeasured third variables in a multi-wave study. *Journal of Occupational and Organizational Psychology, 75*, 33-58.

Durcharme, L. J., & Martin, J. K. (2000). Unrewarding work, coworker support and job satisfaction. *Work and Occupations, 27*, 223-244.

Edimansyah, B. A., Rusli, B. N., Naing, L., Rusli, B. A. M., Winn, T., & Ariff, B. R. H. T. M. (2008). Self -perceived Depression, Anxiety, Stress and Their Relationships with Psychosocial Job Factors in Male Automative Assembly Workers. *Industrial Health, 46*, 90-100.

Escriba-Aguir, V., & Tenias-Burillo, J. M. (2004). Psychological well-being among hospital personnel: the role of family demands and psychosocial work environment. *Int Arch Occup Environ Health 77*, 401-408.

Eum, K.-D., Li, J., Jhun, H.-J., Park, J.-T., Tak, S.-W., Karasek, R., et al. (2007). Psychometric properties of the Korean version of the job content questionnaire: data from helath care workers. *International Archives of Occupational and Environmental Health, 80*, 497-504.

Fujishiro, K. (2005). *Fairness at work: Its impact on employee well-being.* The Ohio State University.

Geert Hofstede cultural dimensions (2009). from http://www.clearlycultural.com/geert-hofstede-cultural-dimensions/individualism/

Gilbreath, B., & Benson, P. G. (2004). The contribution of supervisor behaviour to employee psychological well-being. *Work & Stress, 18*(3), 255-266.

Gimeno, D., Benavides, F. G., Amick III, B. C., Benach, J., & Martinez, J. M. (2004). Psychosocial factors and work-related sickness absence among permanent and non-permanent employment

Hadi, A. A., Naing, N. N., Daud, A., & Nordin, R. (2006). Reliability and construct validity of the Malay version of the job content questionnaire (JCQ) among secondary school teachers in Kota Bharu, Kelantan, Malaysia. *The Southeast Asian Journal of Tropical Medicine and Public Health, 37*(6), 1254-1259.

Hausser, J. A., Mojzisch, A., Niesel, M., & Schulz-Hardt, S. (2010). Ten years on: A review of recent reserach on the Job Demand-Control (-Support) model and psychological well-being. *Work & Stress, 24*(1), 1-35.

House, J. S. (1981). *Work Stress and Social Support*. London: Addison-Wesley Publishing Company Inc.

Huda, B., Rusli, B., Naing, L., Tengku, M., Winn, T., & Rampal, K. (2004). A Study of Job Strain and Dissatisfaction among Lecturers in the School of Medical Sciences Universiti Sains Malaysia. *Southeast Asian Journal Tropical Medicine and Public Health, 35*(1), 210-218.

ILO/WHO (1984). Psychosocial factors at work: recognition and control. Retrieved from http://www.who.int/occupational_health/publications/ILO_WHO_1984_report_of_the_joint_committee.pdf

Johnson, J. V. (1986). *The impact of workplace social support, job demands and work control upon cardiovascular disease in Sweden.* University of Stockholm, Stockholm.

Johnson, J. V., & Hall, E. M. (1988). Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *American Journal of Public Health, 78*(10), 1336-1342.

Jones, F., & Fletcher, B. C. (1996). Job control and health. In M. J. Schabracq, J. A. M. Winnubst & C. L. Cooper (Eds.), *Handbook of Work and Health Psychology* (pp. 33-50). Chichester: Wiley.
Journal of Epidemiology and Community Health, 58, 870-876.

Karasek, R. (1979). Job Demands, Job Decicion Latitude, and Mental Strain: Implications for Job Redesign. *Administrative Science Quarterly, 24*(285), 308.

Karasek, R. (1985). *Job content questionnaire and user's guide*. Lowell: University of Massachusetts.
Karasek, R., & Theorell, T. (1990). *Healthy work: stress, productivity, and the reconstruction of working life*. New York, NY: Basic Books.

Kawakami, N., Kobayashi, F., Araki, S., Haratani, T., & Furui, H. (1995). Assessment of job stress dimensions based on the job demands-control model of employees of telecommunication and electric power companies in Japan: reliability and validity of the japanese version of the job content questionnaire. *International Journal of Behavioral Medicine 2*(4), 358-375.

Kitaoka-Higashiguchi, K., Nakagawa, H., Morikawa, Y., Ishizaki, M., Miura, K., Naruse, Y., et al. (2002). The association between job demand, control and depression in workplace in Japan. *Journal of Occupational Health, 44*, 427-428.

Kivimaki, M., Elovainio, M., Vahtera, J., & Ferrie, J. E. (2003). Organisational justice and health of employees: prospective cohort study. *Occupational and Environmental Medicine, 60*(1).

Lange, A. H. d., Taris, T. W., Kompier, M. A. J., Houtman, I. L. D., & Bongers, P. M. (2003). The very best of the millennium: Longitudinal reserach and the Demand-Control-(Support) Model. *Journal of Occupational Health Psychology, 8*(4), 282-305.

Leong, C. S., Furnham, A., & Cooper, C. L. (1996). The moderating effect of organizational commitement on the occupational stress outcome relationship. *Human Relations, 49*, 1345-1363.

Linfords, P. M., Meretoja, O. A., Toyry, S. M., Luukkonen, R. A., Elovainio, M. J., & Leino, T. J. (2007). Job satisfaction, work ability and life satisfaction among Finnish anaesthesiologists. *Acta Anaesthesiol Scand 51*, 815-822.

Loretto, W., Popham, F., Platt, S., Pavis, S., Hardy, G., Macleod, L., et al. (2005). Assessing psychological well-being: A holistic investigation of NHS employees. *International Review of Psychiatry 17*(5), 329-336.

Macklin, D. S., Smith, L. A., & Dollard, M. F. (2006). Public and private sector work stress: Workers compensation, levels of distress and job satisfaction, and the demand-control-support model. *Australian Journal of Psychology, 58*(3), 130-143.

Meier, L. L., Semmer, N. K., Elfering, A., & Jaconshagen, N. (2008). The double meaning of control: Three-way interactions between internal resources, job control and stressors at work. *Journal of Occupational Health Psychology, 13*(3), 244-258.

Netterstrom, B., Conrad, N., Bech, P., Fink, P., Olsen, O., Rugulies, R., et al. (2008). The Relation between Work-Related Psychosocial Factors and the Development of Depression. *Epidemiologic Reviews Advance Access*, 1-15.

Niedhammer, I., Chastang, J.-F., & David, S. (2008). Importance of psychosocial work factors on general helath outcomes in the national French SUMER survey. *Occupational Medicine, 58*, 15-24.

Noblet, A. (2003). Buidling health promoting work settings:identifying the relationship between work characteristics and occupational stress in Australia. *Health Promotion International, 18*(4), 351-359.

Parasuraman, S., Greenhaus, J. H., & Granrose, C. S. (1992). Role stressors, social support, and well being among two-career couples. *Journal of Organizational Behavior, 13*, 339-356.

Park, K.-O., Wilson, M. G., & Lee, M. S. (2004). Effects of Social Support at Work on Depression and Organizational Productivity. *American Journal of Health Behavior, 28*(5), 444-455.

Parris, M. A. (2003). Work teams: Perceptions of a ready-made support system? *Employee Responsibilities and Right Journal, 15*, 71-83.

Pelfrene, E., Vlerick, P., Kittel, F., Mak, R. P., Kornitzer, M., & Backer, G. D. (2002). Psychosocial work environment and psychological well-being: assessement of the buffering effects in the job demand-control(-support) model in BELSTRESS. *Stress and Health, 18*, 43-56.

Phakthongsuk, P. (2009). Construct validity of the Thai version of the job content questionnaire in a large population of heterogeneous occupations. *Journal of Medical Association of Thailand, 92*(4), 564-572.

Pomaki, G., & Anagnostopoulou, T. (2003). A test and extension of the demand/control/social support model: Prediction of wellness/health outcomes in Greek teachers. *Psychology and Health, 18*(4), 537-550.

Rael, E. G. S., Standsfeld, S. A., Shipley, M., Head, J., Feeney, A., & Marmot, M. (1995). Sickness absence in the Whitehall II study, London: The role of social support and material problems. *Journal of Epidemiology and Community Health, 49*, 474-481.

Rasku, A., & Kinnunen, U. (2003). Job conditions and wellness among Finnish upper secondary school teachers. *Psychology and Health, 18*(4), 441-456.

Rijk, A. E. d., Blanc, P. M. L., Schaufeli, W. B., & Jonge, J. d. (1998). Active coping and need for control as moderators of the job demand-control model: Effects on burnout. *Journal of Occupational and Organizational Psychology, 71*, 1-18.

Rodriguez, I., Bravo, M. J., Peiro, J. M., & Schaufeli, W. (2001). The Demands-Control-Support Model, locus of control and job dissatisfaction: a longitudinal study. *Work and Stress, 15*(2), 97-114.

Searle, B. J., Bright, J. E. H., & Bochner, S. (1999). Testing the 3-factor model of occupational stress: The impact of demands, control and social support on a mail sorting task. *Work & Stress, 13*(3), 268-279.

Shimazu, A., Shimazu, M., & Odahara, T. (2004). Job control and social support as coping resources in job satisfaction *Psychological Reports, 94*, 449-456.

Smith, P. M. (2007). *Examining the causal relationship between job control and health status in the Canadian working population.* Universiti of Toronto, Canada.

Sparks, K., & Cooper, C. (1999). Occupational differences in the work-strain relationship; towards the use of situation-specific models. *Journal of Occupational and Organizational Psychology, 72*, 219-228.

Synder, L. A., Kraus, A. D., Chen, P. Y., Finlinson, S., & Huang, Y. H. (2008). occupational safety: Application of the job demand-control-support model. *Accident Analysis & Prevention, 40*, 1713-1723.

Verhoeven, C., Maes, S., Kraaij, V., & Joekes, K. (2003). The job-demand-control-social support model and wellness/health outcomes: A European study. *Psychology and Health, 18*(4), 421-440.

Wong, J.-Y., & Lin, J.-H. (2007). The role of job control and job support in adjusting service employee's work-to-leisure conflict. *Tourism Management, 28*(3), 726-735.

Xiao, S. Y. (1994). Theory and application of informal support questionaire. *Journal of Clinical Psychological Medicine, 2*, 98-100.

Xie, J. L. (1996). Karasek's model in the people's Republic of China: Effects of job demands, control and individual differences. *Academy of Management Journal, 39*, 1594-1618.

Yperen, N. W. V., & Hagedoorn, M. (2003). Do high job demands increase intrinsic motivation or fatigue or both? The role of job control and job social support. *Academy of Management Journal, 48*(3), 339-348.