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Stress among South African construction professionals: a job demand-control-support survey

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Research into workplace stress in the construction industry has been dominated by studies undertaken in Hong Kong, England and Australia, with relatively little attention having been paid to African countries. A purposively selected sample of thirty-six construction professionals (comprising architects, project managers, construction managers, engineers and quantity surveyors) based in Cape Town, South Africa, were surveyed regarding their perceptions about, and experiences of, workplace stress. The purpose was to identify and rank job demand, job control and job support factors and to analyse these by gender and professional grouping, both in terms of how respondents perceived them, as well as in terms of how frequently they had experienced them. The main finding was that respondents' *perceptions about the importance* of job demand, job control and job support factors were largely consistent with their own *experience* of these factors. Distinguishing between perceptions and experience of stressors and moderators of stress was, however, considered valuable because the fact that differences were found indicates the need for precision in the design of scales. The highest ranked factors were, respectively, 'critical time constraints', 'volume of work' and 'adequate compensation (salary)'. Women and men ranked items differently, as did the various professional groups. The main conclusions were that the construction project environment is a time-pressured, complex, environment in which work-life balance is negatively affected, particularly for women. Control over the type, flow and volume of work were perceived to be the main moderators of stress, whilst salary and career path opportunities were perceived to be the main job support moderators of stress. The applicability of using the job demand–control–support framework was confirmed given that the main stressors, control and support moderators were found to be to be largely consistent with the findings of previous studies. Future research taking a gendered approach should anticipate issues important to female respondents and should consider the benefits of qualitative methods. The design of research focusing on construction professionals should consider using the project team as the unit of analysis to ensure that the influence of the interconnectedness of participants' roles is taken into account.

Keywords: JDC-S model, job control, job demand, job support, workplace stress.

Introduction

Background

The working environment and the nature of work itself are both important influences on the health and well-being of working people (Marmot and Wilkinson, 2006) and, thus, their efficiency. Psychosocial risks have been identified as one of the key emerging risks facing workers' occupational health and safety today (European Agency for Safety and Health at Work, 2009). Linked to psychosocial risks, issues such as work-related stress, workplace violence and harassment are widely recognized as major challenges to occupational health and safety, and more broadly, to public health (European Agency for Safety and Health at Work, 2009).

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Psychosocial risk refers to the potential for the psychological or physical well-being of a worker to be harmed as a result of how work is designed and managed within organizational and social contexts (Cox and Griffiths, 2005). The work factors associated with psychosocial risk are excessive workload and work pace, job uncertainty, inflexible work schedules, irregular, unpredictable or unsocial work hours, poor interpersonal relationships, lack of participation, unclear role in the organization, poor communication, poor career development and conflicting demands of work and home (Cox, 1993). The impact of psychosocial risks on individual employees can be that both their performance and their health deteriorate under conditions where they are unable to develop appropriate controls or coping responses to chronic strain (McTernan *et al.*, 2013). Occupational stress occurs when workers are unable to cope with or control the demands of their work environments (European Agency for Safety and Health at Work, 2009). Consequently, the effect of their diminished performance, due to psychosocial risks, manifests as a financial burden to the individuals themselves, as well as to organizations and societies (European Commission, 2002; European Agency for Safety and Health at Work, 2009). The European Agency for Safety and Health at Work (2014) review of literature quantifying the cost of work-related stress and psychosocial risks concludes that the financial burden on societies is considerable, costing societies and organizations billions of Euros annually, a finding which establishes a strong business case for the prevention of such risks (European Agency for Safety and Health at Work, 2014).

Leung, Chan *et al.* (2015) list 46 construction sector work stress studies done over the past 25 years, with various *foci*. Approximately half of the studies involved construction company employees (workers/labourers: 19%; site managers: 9%; cost estimators/personnel: 19%) and half involved consultants/professionals (engineers: 9%; project managers: 9%; other professionals: 35%). The geographical spread of these studies is skewed towards Hong Kong (50%), England (15%) and Australia (15%), with only 11% having been undertaken in African countries. Against this background, there is a strong case for more research to be done in the African context. South Africa's *apartheid* history makes it a case of special interest, given the abundance of unskilled labour and the shortage of skills in the construction professions (Department of Higher Education and Training, 2014), as well as the high levels of stress reported by construction professionals (Bowen *et al.*, 2013).

The purpose of the current study was: firstly, to identify the main self-reported demand, control and support factors perceived by construction industry professionals in South Africa, with the intention of informing the design of interventions; secondly, to determine whether differences exist between perceptions of these factors' importance and the frequency of respondents' personal experience thereof; thirdly, to identify differences in responses in terms of gender and professional grouping; and finally to test whether expanding the set of variables used in a study undertaken by Bowen *et al.* (2013) would produce new information. The research question is stated as: 'What are the main job demand, job control and job support factors perceived as important and experienced frequently by men and women construction professionals in South Africa?'

Theoretical framework

The research reported in this paper expands the Bowen *et al.* (2013) study of construction industry professionals. The theoretical framework adopted in that study was based on the job demand–control–support (JDC-S) model of occupational stress (see Johnson and Hall, 1988), the appropriateness of which was argued in Bowen *et al.* (2013). According to the JDC-S theory of occupational stress, jobs that are simultaneously high in demands, low in control and low in workplace social support are experienced as the most stressful and produce the most damaging health impacts (Michie, 2002).

The scale items used by Bowen *et al.* (2013) in their research instrument were adaptations of the Job Content Questionnaire (JCQ) (Karasek, 1985). Karasek (1985) encouraged the adaptation of the scales to deal with the 'situation-specific' measurement of 'detailed problems that are important in the surveyed work site'. Although this was probably intended to encourage the broadening of Karasek's (1985) JCQ, the researchers modified the original scale items to include items deemed more appropriate for the South African construction industry, informed by the literature (Sutherland and Davidson, 1989; Cox, 1993; Michie, 2002; Sale and Kerr, 2002; Haynes and Love, 2004; Loosemore and Waters, 2004; Leung *et al.*, 2005; Ng *et al.*, 2005; Leung, Skitmore *et al.*, 2007; Leung, Chan *et al.*, 2009; Love *et al.*, 2010; Ibem *et al.*, 2011; Pinto *et al.*, 2014). The findings of the Bowen *et al.* (2013) research showed strong support for the JDC-S model. The research instrument used in that study contained nine items in the 'Job Demands' scale, six in the 'Job Control' scale and four in the 'Support at Work' scale. In the analysis of the data, it emerged that greater complexity in the scales would benefit the interpretation of how control and support factors moderate workplace stress.

The findings of the current study are an important step towards deepening our understanding of workplace stress in the South African construction sector, which will, in turn, provide a foundation for the development of appropriate interventions.

Job demand

Job demand refers to the stressors involved in accomplishing one's workload, dealing with unexpected tasks, and handling job-related personal conflict (Karasek, 1979, 1985). It can be understood as the perception of the relationship between the amount of mental and physical processing capability, or resources available, and the amount required by the task (Demerouti *et al.*, 2001). Research has identified the following as significant stressors for construction managers: work over- and under-load, role conflict and role ambiguity, unpaid overtime, cost/budget constraints and financial pressures, lack of career progression opportunities, working with a range of personalities, travel, keeping abreast of evolving technology, fear of retrenchment/redundancy, clients' demands, shortage of resources, and task frustrations (Sutherland and Davidson, 1989; Chartered Institute of Building, 2006; Love *et al.*, 2010).

Job control

Job control refers to the employee's degree of control, or decision latitude, over his or her tasks and conduct during the working day (Karasek, 1979). It can be regarded as a perceived ability to exert some influence over the work environment in order to make it more rewarding and less threatening (Ganster, 1989). Previous studies of occupational stress have shown that lack of job control can be an important cause of strain in various occupations such as nursing and construction (Karasek, 1979; Sauter *et al.*, 1989). Job control concerns the issue of participation in the organization, which can be reflected in whether or not employees feel they have the right to speak freely about matters of concern (Frese, 1987). It also encompasses the balance between levels of authority and responsibility. Tasks associated with low levels of authority and high levels of responsibility deprive employees of the ability to exert influence over their work and the working environment, thereby inducing stress (Schieman and Reid, 2009). Lack of control may also affect relationships with project team members or superiors, the consequences of which (such as arguments with colleagues) can significantly affect stress levels (Leung *et al.*, 2009). Conversely, good interpersonal relationships at work can facilitate good performance (Djebarni, 1996) that, in turn, can help to alleviate stress (Jex, 1998).

Job support

Job support refers to being trusted, respected and supported by colleagues and superiors. Working in such conditions enhances employees' sense of well-being and reduces their stress, which can positively influence commitment and improve job satisfaction (Stenman *et al.*, 2010). Those who perceive themselves as having support from their supervisor report more job satisfaction, more emotional commitment to the organization and less turnover intentions (Taylor, 2008). In addition, job support from both supervisors and colleagues can act as a moderator of stress (Mayo *et al.*, 2012).

The South African context

South Africa is the fourth most populous country in Africa, with a population of 50.5 million and in 2011 accounted for the third highest share of the African economy after Nigeria and Egypt. Together with Algeria, these four countries account for 60% of Africa's GDP (African Development Bank, 2014).

South Africa has a working age population of 36 million and in 2014 had an unemployment rate of 25% (strict definition) or 36% (expanded definition), which is considered very high by global standards. The construction sector absorbs 7.9% of the 15.1 million employed people in the country (Statistics South Africa, 2014b) and contributes 4% to GDP (Statistics South Africa, 2014a). Official statistics put the proportion of women at 50% of economically active professionals (Department of Labour, 2005), but the percentages of professional women in the construction sector are significantly lower. Percentages of women in the construction professions were as follows in 2013: architects, 20%; quantity surveyors (QS), 12%; civil engineers, 2%; construction project managers, 3%; and construction managers, 0.6% (Council for the Built Environment, 2013).

Under *apartheid*, South Africans were classified as 'white' (i.e. of European origin), 'black' (i.e. of African origin), 'coloured' (i.e. of mixed European and African or Indonesian or Malaysian ancestry), or 'Asian' (i.e. of Indian origin). Post-1994, the South African government introduced affirmative action policies (Republic of South Africa, 1996, 2000), which under the umbrella of broad-based black economic empowerment (BBBEE) – defined as the 'viable economic empowerment of all black people' (Republic of South Africa, 2013, p. 4) – includes preferential procurement in the award of building contracts and the appointment of consultants. 'Fronting', defined as any practice that undermines the achievement of the objectives of the BBBEE Act, is a problem and is a punishable offence (Republic of South Africa, 2013, p. 4). Preferential

procurement is only applicable to public sector projects, but consultancies that operate in both the public and private sectors typically employ sufficient previously disadvantaged individuals and/or include them as owners, specifically to gain advantage when tendering on public projects. At several levels, there is the potential for these practices to be felt as discriminatory and for them to result in work-related stress (King, 2005; De Haas *et al.*, 2009; Dollard *et al.*, 2012).

In order to better understand the characteristics of the sample surveyed in the current study, the following should be noted. Architects, engineers, construction managers, project managers and QS are all required by law to register with their respective professional Councils before being allowed to practice for their own account, but registration is typically a requirement for employees as well. In all of these professions, the route to registration is both long (degree courses of 4 years minimum) and essentially exclusive, with 'white' people enjoying an advantage in that they typically come from greater wealth, attend better schools and thus meet university entrance requirements more easily. Not all higher education institutions' degree programmes are accredited by the registration Councils. Those that are accredited are mainly at the better-resourced, more expensive, established universities with the student profile in these disciplines being disproportionately 'white'.

Gender

Loosemore and Waters (2004) surveyed Australian construction professionals with the aim of testing the hypothesis that high levels of stress exist among female construction professionals and that there are differences in the stress levels of men and women. Using Cooper's Occupational Stress Indicator (OSI) (Cooper *et al.*, 1988) on a sample of 84 men and 47 women, arguably reflecting the general underrepresentation of women in the industry, they found that 'long hours of work' and 'too much work' were the greatest sources of stress for both men and women.

The general finding of their study was that men reported experiencing marginally higher levels of stress than did women in all categories of the OSI (factors intrinsic to the job, managerial role, relationships with others, career and achievement, organizational structure and climate), except 'career and achievement' where men and women experienced stress equally. Statistically significant differences were found for risk-taking, disciplinary roles and implications of mistakes, where men, more than women, experienced greater stress related to their relatively senior positions. Men were also found to experience greater stress than women due to the threat of impending redundancy and changing jobs to progress their careers, indicating that women experienced greater job security than did men as a result of their relatively lower and less vulnerable positions. The areas where women experienced greater stress than did men included: 'opportunities for personal development, rates of pay, keeping up with new ideas, business travel, the accumulative effect of minor tasks, and factors not under their control' (Loosemore and Waters, 2004, p. 131).

Sang *et al.* (2007) consider the Loosemore and Waters (2004) findings surprising and suggest that the paucity of research comparing stress experienced by men and women in the construction industry reflected both the relatively low number of women working in the industry and compromised the potential for meaningful statistical comparisons. They argue the need to investigate the role of gender in terms of how it defines stress experienced by architects, since many previous studies had focused on the lived experience of architects without adopting this lens. Much of the body of research focused on the experience of women in architecture and drew conclusions relating to: their 'victim' status (Sang *et al.*, 2007, citing Adams and Tancred, 2000); discrimination against them in practices and on site, as well as in level of pay (Kingsley and Glynn, 1992; Whitman, 2005); task restrictions and consequent effect on promotability; and poor work-life balance (Anthony, 2001; Whitman, 2005). Other research was limited in its ability to draw comparisons between men and women because of the selection of women-only samples (Caven, 2004; De Graft-Johnson *et al.*, 2005).

Sang *et al.* (2007) surveyed 75 male and 35 female architects in the UK, comparing job satisfaction of men and women. They found that men generally reported greater job satisfaction than did women. The only statistically significant differences were found for 'physical working conditions', 'opportunity for promotion' and 'the way that their practice is managed', where women were less satisfied than men (Sang *et al.*, 2007, p. 1310). They concluded that their findings probably reflected the general subordination of women, both within the architectural profession as well as in the construction industry, with the consequent effect of higher levels of attrition (Sang *et al.*, 2007).

Bowen *et al.* (2013) surveyed 554 male and 122 female construction industry professionals. They noted a *caveat* with regard to potential sample bias, suggesting that women architects, engineers and QS appeared to be overrepresented compared with the registered populations of such professionals (Council for the Built Environment, 2013), and that women construction and project managers were not represented at all. Statistically, proportionately more women were

architects than in all other professional groups. Regarding overall levels of stress, the study found that stress level was significantly related to gender with proportionately more women reporting high levels of stress compared to men. Considering job demand factors, Bowen *et al.* (2013, p. 401) found that a significant relationship existed between hours of work and gender, with men claiming to work longer hours than did women. Gender was also found to be significantly related to feelings of 'job security' and 'perceived ability to acquire a similar job without undue delay', where it was found that proportionately more men than women were optimistic (Bowen *et al.*, 2013, p. 399). Job control factors similarly revealed significant relationships in terms of gender, where men reported more control than did women over 'what work is done', 'pace of work' and 'work environment' (Bowen *et al.*, 2013, p. 398). No significant relationships were found for job support factors and gender, generally. However, within professional groupings, it was found that a significant relationship existed between male and female QS and 'reliance on colleagues to help with difficult situations', with more men than women claiming to be able to rely on their colleagues for assistance (Bowen *et al.*, 2013, p. 399).

The Bowen *et al.* (2013) study concluded that its findings were consistent with those of previous research (Goldenhar *et al.*, 1998; Caven, 2004; Sang *et al.*, 2007) that women in the construction industry, and especially women architects, experienced higher levels of stress than did similarly employed men.

Construction professionals

Several recent studies have focussed on stress of construction professionals, typically including architects, construction and project managers, engineers, QS and estimators (see Chartered Institute of Building, 2006; Lingard and Francis, 2006; Love *et al.*, 2010; Ibem *et al.*, 2011; Mostert *et al.*, 2011; Leung and Chan, 2012; Bowen *et al.*, 2013; Poon *et al.*, 2013; Bowen *et al.*, 2014; Leung, Bowen *et al.*, 2015). Only Bowen *et al.* (2013) presents a statistical analysis in which it is possible to interpret differences between the various professional groupings with reference to job demand, job control and job support factors.

Bowen *et al.* (2013) found significant differences between professional groupings in a study of 676 professionals comprising architects, civil engineers, project managers, construction managers and QS. Based on a self-assessment of overall stress levels, architects considered themselves the most highly stressed, followed by civil engineers, QS, and project and construction managers. With reference to job demands, the study found that significantly more project and construction managers reported being stressed by the requirement to work to tight deadlines than did the other professionals. Another significant finding was that proportionally more engineers reported having to work long hours as a stressor, compared with other professional groupings. Considering organizational stressors, architects were significantly more pessimistic than other professional groupings about the security of their existing jobs, as well as their perceived ability to get another job reasonably quickly. Significant differences were found between professional groupings in respect of job control factors, with architects, more than all other professionals, reportedly having less control over 'work environment', 'pace of work' and 'workplace tasks' (Bowen *et al.*, 2013, p. 398). No significant differences were found between professional groupings for job support items.

Referring to stressors related to the work environment, Bowen *et al.* (2013) found the following, significantly in all cases. Architects, followed by QS, engineers and project/construction managers (PCM), reported not being able to speak openly about matters of concern. Similarly, architects, more than QS, believed that they lacked the necessary authority to match the responsibility of their jobs, but engineers and PCM did not agree with this. Only architects felt that having more time would enable them to do a better job and they further believed that they were not fairly remunerated, more so than the other professionals.

Research method and questionnaire design

The research instrument

Three sections of a multisectional questionnaire, comprising scales for Job Demand (25 items), Job Control (19 items) and Job Support (17 items) factors (see Table 1), are reported and analysed in this paper.

Scale items were largely drawn from the literature (see Sutherland and Davidson, 1989; Haynes and Love, 2004; Ng *et al.*, 2005; Leung, Skitmore *et al.*, 2007; Leung, Chan *et al.*, 2009; Love *et al.*, 2010; Ibem *et al.*, 2011), but were augmented with additional items based on the researchers' combined knowledge of, and experience in, the South African construction industry. Additional input was provided by an industrial psychologist.

Administration of the survey

Given the complexity of the survey instrument, it was deemed necessary to meet with respondents to explain the research and the requirements. The first ten

Table 1 Scales of job demand, job control and job support items perceived as contributors to, or moderators of, workplace stress

Item	Job demand variables (25-item scale)	Job control variables (19-item scale)	Job support variables (17-item scale)
1.	Critical time constraints	Flow of work	Co-worker competence
2.	Critical cost constraints	Volume of work	Supervisor competence
3.	High level reporting demands	Type of work	Co-worker support
4.	Frequency of reporting demands	Physical environment	Supervisor support
5.	Complexity of project problems	Power to delegate	Co-worker interpersonal skills
6.	Adequacy of technical resources (ICT, etc.)	Ergonomics	Supervisor interpersonal skills
7.	Task frustrations (interruptions)	Decision-making authority	Fairness of criticism from others
8.	Level of cooperation from other project stakeholders	Decision latitude	Recognition from others
9.	Level of professional skills required	Staff availability	Freedom to speak openly
10.	Amount of professional experience required	Staff competence	Opportunities for skills enhancement
11.	High-level meetings required	Team size/composition	Positive job security
12.	Number of meetings required	ICT resources	Adequate compensation (salary)
13.	Leadership skills needed	Busyness and breaks	Appropriate career path potential
14.	Number of other staff involved	Work travel	Freedom from health issues
15.	Information processing level required	Role conflict	Absence of personal/family issues
16.	Long working hours required	Forced redeployment	Absence of harassment at work
17.	Interpersonal skills required	Forced relocation	Absence of discrimination at work
18.	Red tape levels encountered	Forced shift-work	
19.	ICT competence level required	Forced termination	
20.	Need to 'prove' oneself		
21.	Skewing of work-family life balance		
22.	Job travel demands		
23.	Disruption to meal patterns		
24.	Disruption to leisure activities		
25.	Disruption to sport/exercise activities		

completed questionnaires, the completion of which was assisted by the researchers, were treated as a pilot study. These ten respondents were asked to comment on the adequacy of the instrument. No changes were suggested, but they considered the length of the entire multisectional instrument to be problematic. Consequently, the researchers decided on a field administration approach and met with all subsequent respondents to explain the research and requirements. Research assistants were engaged to do this.

Purposive sampling was used to identify suitable respondents. This sampling method ensured representation of professional disciplines and both genders (Patton, 2002). The target frame was restricted to professionals working in the construction industry in the Western Cape province of South Africa, and largely to the metropolitan boundaries of Cape Town. Respondents were selected on the basis that they were experienced, defined as being registered with a professional Council with at least five years post-registration work experience. Thirty-six completed surveys (including the 10 from the pilot study) have been concluded. The profile of the respondents comprised: 11 architects (7 male, 4 female); 8 PCM (7 male, 1 female); 5 engineers (4 male, 1 female); and 12 QS (7 male, 5 female). The racial profile of the sample was 75% 'white', 17% 'coloured' and 8% 'black'.

The small sample size is a limitation of the research reported in this paper and the results should be interpreted with caution. This is particularly true of the gendered analysis of the responses of PCMs and engineers, where each of these professional groupings had only one female respondent. Given the small overall sample size, the use of nonparametric statistical analyses was considered appropriate (see Pett, 1997; Corder and Foreman, 2014).

Results and analysis

The Job Demand scale measures typical job demand situations encountered by professionals working on projects in the construction industry. The Job Control scale measures employees' degree of control, or decision latitude, over their tasks and conduct. The Job Support scale measures perceptions of trust, respect and support by colleagues and superiors.

Respondents were asked (i) to rate how important they perceived each scale item to be and also (ii) to select and rank five of the same items in terms of how frequently they had personally experienced them. Hereinafter, the terms 'perceived importance' and 'frequently experienced' are used to refer to these two data sets. A five-point frequency scale with interval definitions was given for the rating of each item (1 = negligible or least frequently experienced; 5 = major or most frequently experienced). Respondents were invited to propose up to two additional items for each scale, but none did so. The importance of items in the Job Demand scale was rated in terms of the perception of items as stressors, but for the Job Control and Job Support scales, the rating was in terms the perception of items as moderators of workplace stress.

The reliability of the instrument was tested (Cronbach's alpha for the Job Demand, Job Control and Job Support scales is 0.89, 0.83 and 0.89, respectively), indicating very good-to-excellent internal consistency in each set. The data set was subjected to missing value analysis involving the detection of anomalies, with no anomalous cases being identified.

The Kolmogorov–Smirnov test for normality was applied to the importance ratings, and the values of the statistic were below 0.05 for all items in each scale, indicating a violation of the assumption of normality. Nonparametric techniques were therefore employed to examine differences between groups in terms of gender and professional groupings. Specifically, the Mann–Whitney *U*-test was used to test for differences on the basis of gender, and the Kruskal–Wallis *H*-test for differences on the basis of professional grouping (see Pett, 1997; Corder and Foreman, 2014).

Finally, an 'impact score' was calculated by multiplying the overall mean values of the top five frequently *experienced* Job Demand, Control and Support items (Tables 5, 7 and 9) by the mean values of those items' perceived *importance* (Tables 2–4). These 'impact scores', which essentially represent the subjective emotion for each item, were then separately ranked for Job Demand, Control and Support items, and Mann–Whitney *U*-test and Kruskal–Wallis *H*-test statistics were used to analyse differences between genders and professional groupings.

Perceived importance of stressors and moderators

The highest ranked items in terms of their perceived importance were c*ritical time constraints* (Job Demand, see Table 2), *volume of work* (Job Control, see Table 3) and *adequate compensation (salary)* (Job Support, see Table 4). Deeper analyses of the rankings in each subscale, by gender and professional grouping, are presented below.

Job demand

A Mann–Whitney *U*-test revealed significant differences between male ($Md = 2$, $n = 24$) and female ($Md = 3$, $n = 11$) perceptions regarding: *disruption to meal patterns*, $U = 65$, $z = -2.45$, $p = 0.014$; *disruption to leisure activities*, $U = 67.5$, $z = -2.38$, $p = 0.017$; and *disruption to sport/exercise activities* $U = 66.5$, $z = -2.38$, $p = 0.017$ (see Table 2). Women, more than men, perceived all three of these factors to be stressors.

According to a Kruskal–Wallis *H*-test, there were no significant differences between professional groupings in respect of Job Demand items. However, a noteworthy difference was found regarding the importance of *disruption to sport/exercise activities*, where PCMs and QSs considered this to be a greater stressor than did the other two professional groups (architects: $n = 10$; PCMs: $n = 8$; engineers: $n = 5$; QSs: $n = 12$), χ^2 (3, $n = 35$) = 7.02, $p = 0.071$, with medians of 1.5, 4, 2 and 3.5, respectively (see Table 2).

Job control

The Mann–Whitney *U*-test revealed that the only significant difference between men ($Md = 3$, $n = 24$) and women ($Md = 2$, $n = 11$) was with regard to *staff availability*, $U = 74$, $z = -2.11$, $p = 0.035$, with men, more than women, regarding greater levels of control over staff resourcing to be a moderator of job stress (see Table 3). The test also indicated a noteworthy difference in the perceptions of men ($Md = 2$, $n = 24$) and women ($Md = 3$, $n = 11$) regarding the moderating influence of *ergonomics*, $U = 80$, $z = -1.94$, $p = 0.053$ (see Table 3), with women, more than men, perceiving control over ergonomics as having a moderating influence on stress.

A Kruskal–Wallis *H*-test highlighted significant differences between professional groupings regarding control over the *physical environment* (architects: $n = 10$; PCMs: $n = 8$; engineers: $n = 5$; and QSs: $n = 12$), χ^2 (3, $n = 35$)=9.04, $p = 0.029$, with medians of 3, 3.5, 3 and 1.5, respectively; and for *forced relocation*, χ^2 (3, $n = 35$) = 8.57, $p = 0.036$, with medians of 1, 3.5, 2 and 1, respectively (see Table 3). PCMs, more than all the other professional groups, regarded control over the *physical environment* as an important moderator of stress, as did engineers, albeit to a lesser extent. Further, the test found a noteworthy difference in the perceptions of the various professional groupings regarding the moderating influence of *type of work* (architects: $Md = 3$, $n = 11$; PCMs: $Md = 3$, $n = 8$; engineers: $Md = 4$, $n = 5$; QSs: $Md = 2$, $n = 12$), χ^2 (3, $n = 36$)

Table 2 Job demand items as contributors to workplace stress (n = 36)

Job demand item	Mean (±SE)	Rank	Gender			Profession				
			Male (n = 25)	Female (n = 11)	p-value[a]	Architect (n = 11)	PCM (n = 8)	Engineer (n = 5)	QS (n = 12)	p-value[b]
Critical time constraints	4.06 (±0.178)	**1**	4.08 (±0.208)	4.00 (±0.357)	0.942	3.82 (±0.296)	4.63 (±0.183)	3.80 (±0.735)	4.00 (±0.326)	0.367
Critical cost constraints	3.42 (±0.180)	**4**	3.48 (±0.201)	3.27 (±0.384)	0.667	2.82 (±0.400)	3.75 (±0.313)	3.60 (±0.510)	3.67 (±0.225)	0.312
High-level reporting demands	2.58 (±0.223)	15	2.60 (±0.258)	2.55 (±0.455)	0.860	2.18 (±0.377)	3.00 (±0.267)	1.80 (±0.490)	3.00 (±0.477)	0.184
Reporting frequency demands	2.47 (±0.197)	18	2.60 (±0.245)	2.18 (±0.325)	0.260	2.09 (±0.343)	3.00 (±0.189)	2.00 (±0.707)	2.67 (±0.376)	0.315
Complexity of project problems	2.94 (±0.207)	8	3.08 (±0.237)	2.64 (±0.411)	0.322	2.55 (±0.390)	3.13 (±0.398)	2.60 (±0.600)	3.33 (±0.355)	0.406
Adequacy of technical resources (ICT, etc.)	2.62 (±0.223)	13	2.43 (±0.225)	3.00 (±0.505)	0.255	2.89 (±0.455)	2.25 (±0.453)	2.20 (±0.490)	2.83 (±0.405)	0.622
Task frustrations (interruptions)	2.92 (±0.193)	9	2.92 (±0.191)	2.91 (±0.476)	0.913	2.64 (±0.432)	3.50 (±0.267)	3.00 (±0.316)	2.75 (±0.351)	0.349
Level of cooperation from other project stakeholders	3.69 (±0.168)	**2**	3.68 (±0.206)	3.73 (±0.300)	0.900	3.82 (±0.352)	3.87 (±0.398)	3.40 (±0.510)	3.58 (±0.229)	0.773
Level of professional skills required	2.44 (±0.197)	21	2.44 (±0.245)	2.45 (±0.340)	1.000	2.36 (±0.338)	2.75 (±0.366)	2.00 (±0.447)	2.50 (±0.417)	0.696
Amount of professional experience required	2.50 (±0.185)	17	2.52 (±0.209)	2.45 (±0.390)	0.789	2.36 (±0.364)	2.63 (±0.324)	2.00 (±0.316)	2.75 (±0.372)	0.614
High-level meetings required	2.47 (±0.185)	19	2.52 (±0.232)	2.36 (±0.310)	0.605	2.45 (±0.413)	2.87 (±0.227)	2.20 (±0.374)	2.33 (±0.355)	0.599
Number of meetings required	3.03 (±0.209)	7	3.16 (±0.221)	2.73 (±0.469)	0.337	3.00 (±0.467)	3.13 (±0.227)	3.00 (±0.316)	3.00 (±0.444)	0.995
Leadership skills needed	2.44 (±0.212)	22	2.48 (±0.259)	2.36 (±0.388)	0.844	2.73 (±0.407)	2.88 (±0.441)	1.80 (±0.374)	2.17 (±0.386)	0.335
Number of other staff involved	2.47 (±0.180)	20	2.48 (±0.193)	2.45 (±0.413)	0.914	2.09 (±0.315)	2.50 (±0.423)	2.60 (±0.245)	2.75 (±0.351)	0.642
Information processing level required	2.64 (±0.196)	12	2.48 (±0.209)	3.00 (±0.426)	0.191	2.36 (±0.338)	2.63 (±0.420)	2.60 (±0.245)	2.92 (±0.417)	0.557
Long working hours required	3.50 (±0.205)	**3**	3.44 (±0.239)	3.64 (±0.411)	0.620	3.27 (±0.407)	3.75 (±0.313)	3.00 (±0.447)	3.75 (±0.411)	0.518
	2.60 (±0.184)	14	2.71 (±0.204)	2.36 (±0.388)	0.407	2.50 (±0.342)	2.75 (±0.366)	2.40 (±0.400)	2.67 (±0.376)	0.894

(*Continued*)

Table 2 (Continued)

Job demand item	Mean (±SE)	Rank	Gender			Profession				
			Male (n = 25)	Female (n = 11)	p-value[a]	Architect (n = 11)	PCM (n = 8)	Engineer (n = 5)	QS (n = 12)	p-value[b]
Interpersonal skills required										
Red tape levels encountered	3.11 (±0.261)	6	3.04 (±0.308)	3.27 (±0.506)	0.586	3.09 (±0.530)	3.63 (±0.565)	2.00 (±0.548)	3.25 (±0.411)	0.182
ICT competence level required	2.09 (±0.236)	23	1.91 (±0.273)	2.50 (±0.453)	0.250	1.75 (±0.412)	2.50 (±0.327)	2.00 (±0.837)	2.08 (±0.452)	0.653
Need to 'prove' oneself	2.57 (±0.210)	16	2.42 (±0.208)	2.91 (±0.495)	0.306	2.10 (±0.482)	3.00 (±0.378)	2.80 (±0.583)	2.58 (±0.313)	0.440
Skewing of work-family life balance	3.40 (±0.236)	**5**	3.21 (±0.276)	3.82 (±0.444)	0.136	3.00 (±0.467)	3.87 (±0.295)	3.00 (±1.080)	3.58 (±0.379)	0.658
Job travel demands	2.03 (±0.161)	24	1.87 (±0.174)	2.36 (±0.338)	0.240	1.50 (±0.224)	2.25 (±0.164)	2.20 (±0.374)	2.25 (±0.372)	0.175
Disruption to meal patterns	2.23 (±0.205)	22	1.87 (±0.211)	3.00 (±0.381)	**0.014***	2.40 (±0.542)	2.63 (±0.263)	1.40 (±0.245)	2.17 (±0.322)	0.226
Disruption to leisure activities	2.89 (±0.235)	10	2.50 (±0.248)	3.73 (±0.428)	**0.017***	2.20 (±0.490)	3.50 (±0.378)	2.40 (±0.400)	3.25 (±0.411)	0.117
Disruption to sports/ exercise activities	2.86 (±0.240)	11	2.46 (±0.248)	3.73 (±0.449)	**0.017***	2.20 (±0.467)	3.38 (±0.420)	2.00 (±0.316)	3.42 (±0.417)	*0.071*[+]

Notes:n = total possible, varies across items.

[a]p-values are from the Mann–Whitney U-test;

[b]p-values are from the Kruskal–Wallis H-test;

*$p < 0.05$;

[+]Noteworthy result.

The bold values indicates that attention to items ranked in the top 5 items, as well as values that are statistically significant.

Table 3 Job control items as moderators of workplace stress (n = 36)

			Gender			Profession				
Job control item	Mean (±SE)	Rank	Male (n = 25)	Female (n = 11)	p-value[a]	Architect (n = 11)	PCM (n = 8)	Engineer (n = 5)	QS (n = 12)	p-value[b]
Flow of work	3.31 (±0.22)	**3**	3.28 (±0.24)	3.36 (±0.51)	0.792	3.18 (±0.46)	3.62 (±0.38)	3.20 (±0.66)	3.25 (±0.39)	0.920
Volume of work	3.58 (±0.21)	**1**	3.72 (±0.22)	3.27 (±0.45)	0.435	3.36 (±0.45)	3.63 (±0.42)	3.80 (±0.74)	3.67 (±0.26)	0.948
Type of work	2.83 (±0.20)	**4**	2.80 (±0.23)	2.91 (±0.42)	0.832	2.73 (±0.38)	3.13 (±0.40)	4.00 (±0.45)	2.25 (±0.28)	*0.056*[+]
Physical environment	2.54 (±0.21)	11	2.38 (±0.25)	2.91 (±0.34)	0.192	2.60 (±0.37)	3.38(±0. 38)	3.00 (±0.32)	1.75 (±0.33)	**0.029***
Power to delegate	2.77 (±0.22)	6	2.75 (±0.26)	2.82 (±0.44)	0.840	2.30 (±0.45)	3.63 (±0.53)	2.60 (±0.68)	2.67 (±0.23)	0.267
Ergonomics	2.14 (±0.19)	17	1.88 (±0.20)	2.73 (±0.38)	*0.053*[+]	2.00 (±0.47)	2.50 (±0.27)	2.20 (±0.58)	2.00 (±0.30)	0.614
Decision-making authority	2.56 (±0.22)	10	2.48 (±0.25)	2.73 (±0.47)	0.803	2.82 (±0.40)	2.88 (±0.48)	2.00 (±0.45)	2.33 (±0.41)	0.580
Decision latitude	2.33 (±0.23)	13	2.44 (±0.27)	2.09 (±0.44)	0.439	2.36 (±0.43)	3.25 (±0.45)	2.00 (±0.45)	1.83 (±0.37)	0.173
Staff availability	2.80 (±0.23)	**5**	3.13 (±0.24)	2.09 (±0.44)	**0.035***	2.40 (±0.54)	3.25 (±0.37)	2.80 (±0.58)	2.83 (±0.37)	0.631
Staff competence	3.44 (±0.23)	**2**	3.64 (±0.23)	3.00 (±0.52)	0.315	3.45 (±0.53)	3.63 (±0.32)	3.00 (±0.71)	3.50 (±0.36)	0.880
Team size/composition	2.71 (±0.22)	8	2.58 (±0.23)	3.00 (±0.51)	0.660	2.20 (±0.42)	3.13 (±0.40)	2.20 (±0.58)	3.08 (±0.38)	0.234
ICT resources	2.32 (±0.22)	14	2.29 (±0.25)	2.40 (±0.43)	0.770	1.89 (±0.54)	2.88 (±0.40)	2.20 (±0.49)	2.33 (±0.31)	0.323
Busyness and breaks	2.77 (±0.21)	6	2.88 (±0.22)	2.55 (±0.47)	0.380	2.40 (±0.50)	3.00 (±0.38)	2.60 (±0.51)	3.00 (±0.33)	0.550
Work travel	2.20 (±0.21)	16	2.13 (±0.24)	2.36 (±0.45)	0.753	2.00 (±0.47)	2.75 (±0.31)	2.00 (±0.55)	2.08 (±0.38)	0.457
Role conflict	2.46 (±0.21)	12	2.33 (±0.21)	2.73 (±0.51)	0.811	2.30 (±0.52)	3.25 (±0.41)	2.40 (±0.40)	2.08 (±0.26)	0.171
Forced redeployment	2.03 (±0.21)	19	2.13 (±0.24)	1.82 (±0.44)	0.431	1.40 (±0.37)	2.88 (±0.44)	2.40 (±0.51)	1.83 (±0.32)	0.070
Forced relocation	2.06 (±0.25)	18	2.25 (±0.30)	1.64 (±0.43)	0.257	1.60 (±0.52)	3.25 (±0.45)	2.40 (±0.51)	1.50 (±0.34)	**0.036***
Forced shift-work	2.29 (±0.25)	15	2.46 (±0.32)	1.90 (±0.35)	0.323	2.56 (±0.56)	3.00 (±0.38)	2.40 (±0.75)	1.58 (±0.36)	0.151
Forced termination	2.68 (±0.30)	9	2.88 (±0.35)	2.20 (±0.57)	0.331	2.56 (±0.65)	3.50 (±0.50)	2.40 (±0.75)	2.33 (±0.54)	0.535

Notes:n = total possible, varies across items.

[a]p-values are from the Mann–Whitney U-test;

[b]p-values are from the Kruskal–Wallis H-test;

*$p < 0.05$;

[+]Noteworthy result.

The bold values indicates that attention to items ranked in the top 5 items, as well as values that are statistically significant.

Table 4 Job support items as moderators of workplace stress ($n = 36$)

			Gender			Profession				
Job support item	Mean (±SE)	Rank	Male ($n = 25$)	Female ($n = 11$)	p-value[a]	Architect ($n = 11$)	PCM ($n = 8$)	Engineer ($n = 5$)	QS ($n = 12$)	p-value[b]
Co-worker competence	3.14 (±0.26)	**2**	3.16 (±0.30)	3.09 (±0.50)	0.902	3.27 (±0.56)	3.50 (±0.57)	3.20 (±0.66)	2.75 (±0.37)	0.646
Supervisor competence	2.56 (±0.28)	**4**	2.56 (±0.32)	2.55 (±0.58)	0.986	2.55 (±0.59)	3.25 (±0.59)	2.40 (±0.60)	2.17 (±0.44)	0.571
Co-worker support	2.42 (±0.21)	7	2.48 (±0.27)	2.27 (±0.36)	0.622	2.45 (±0.47)	3.00 (±0.33)	2.20 (±0.37)	2.08 (±0.38)	0.438
Supervisor support	2.31 (±0.26)	10	2.32 (±0.29)	2.27 (±0.56)	0.806	2.45 (±0.58)	2.75 (±0.59)	2.60 (±0.68)	1.75 (±0.33)	0.519
Co-worker interpersonal skills	2.31 (±0.21)	10	2.24 (±0.25)	2.45 (±0.39)	0.750	2.27 (±0.47)	3.13 (±0.35)	2.40 (±0.25)	1.75 (±0.31)	0.108
Supervisor interpersonal skills	2.11 (±0.25)	13	2.16 (±0.29)	2.00 (±0.49)	0.562	2.36 (±0.54)	2.75 (±0.53)	2.20 (±0.49)	1.42 (±0.31)	0.164
Fairness of criticism from others	2.42 (±0.22)	7	2.52 (±0.26)	2.18 (±0.40)	0.396	2.82 (±0.50)	3.00 (±0.38)	2.00 (±0.32)	1.83 (±0.30)	0.138
Recognition from others	2.09 (±0.20)	14	2.00 (±0.24)	2.27 (±0.38)	0.683	1.70 (±0.42)	2.38 (±0.42)	2.20 (±0.37)	2.17 (±0.37)	0.445
Freedom to speak openly	1.75 (±0.22)	16	1.60 (±0.25)	2.09 (±0.42)	0.313	1.82 (±0.44)	2.50 (±0.50)	1.40 (±0.40)	1.33 (±0.31)	0.250
Opportunities for skills enhancement	2.17 (±0.21)	12	2.17 (±0.26)	2.18 (±0.35)	0.985	2.20 (±0.49)	2.88 (±0.30)	2.00 (±0.55)	1.75 (±0.31)	0.214
Positive job security	2.83 (±0.27)	**3**	2.88 (±0.32)	2.73 (±0.51)	0.623	3.45 (±0.53)	2.50 (±0.42)	2.80 (±0.66)	2.50 (±0.52)	0.487
Adequate compensation (salary)	3.25 (±0.27)	**1**	3.36 (±0.32)	3.00 (±0.49)	0.502	3.27 (±0.56)	3.13 (±0.44)	3.20 (±0.58)	3.33 (±0.53)	0.947
Appropriate career path potential	2.56 (±0.23)	**4**	2.68 (±0.28)	2.27 (±0.43)	0.346	3.09 (±0.50)	2.63 (±0.42)	2.40 (±0.68)	2.08 (±0.34)	0.343
Freedom from health issues	2.53 (±0.24)	6	2.64 (±0.31)	2.27 (±0.38)	0.462	2.55 (±0.56)	3.25 (±0.45)	1.80 (±0.37)	2.33 (±0.36)	0.314
Absence of personal/family issues	2.42 (±0.24)	7	2.16 (±0.28)	3.00 (±0.45)	0.125	2.91 (±0.53)	2.38 (±0.38)	1.40 (±0.25)	2.42 (±0.45)	0.282
Absence of harassment at work	1.74 (±0.23)	17	1.50 (±0.25)	2.27 (±0.45)	*0.095*[+]	2.00 (±0.45)	2.25 (±0.45)	1.00 (±0.00)	1.50 (±0.44)	0.213
Absence of discrimination at work	1.80 (±0.24)	15	1.75 (±0.30)	1.91 (±0.42)	0.578	2.10 (±0.55)	2.50 (±0.54)	1.60 (±0.40)	1.17 (±0.30)	0.140

Notes:n = total possible, varies across items.

[a]p-values are from the Mann–Whitney U-test.

[b]p-values are from the Kruskal–Wallis H-test.

[+]Noteworthy result.

The bold values indicates that attention to items ranked in the top 5 items, as well as values that are statistically significant.

= 7.55, $p = 0.056$ (see Table 3), with engineers, more than the other groups regarding control over this factor as an important moderator of stress.

Job support

A Mann–Whitney *U*-test found no significant differences between the perceptions of men and women regarding the impact of the Job Support items in moderating workplace stress. However, a noteworthy difference was found in the perceptions of men ($Md = 1$, $n = 24$) and women ($Md = 2$, $n = 11$) regarding the moderating influence of an *absence of harassment at work*, $U = 89$, $z = -1.67$, $p = 0.095$ (see Table 4). Women, more than men, regarded this factor as a positive moderator of workplace stress.

A Kruskal–Wallis *H*-test revealed that there were no significant or noteworthy differences in the perceptions of the different professional groupings regarding the impact of Job Support items in moderating workplace stress.

Frequently experienced stressors and moderators

The highest ranked items, in terms of the frequency with which they were experienced, were c*ritical time constraints* (Job Demand, see Table 5); *volume of work* (Job Control, see Table 7); and *adequate compensation (salary)* (Job Support, see Table 9). Deeper analyses of the rankings in each subscale, by gender and professional grouping, are presented below.

Job demand

Comparing the rankings by gender (see Table 5), both men and women ranked *critical time constraints* as the most frequently experienced stressor and included *cooperation from other project stakeholders*, *long working hours required,* and *critical cost constraints* in their five most frequently experienced stressors. Only men included *red tape levels encountered,* and only women included *skewing of work-family life balance*.

A Mann–Whitney *U*-test showed only one significant difference between men ($Md = 0$, $n = 19$) and women ($Md = 0$, $n = 9$): *disruption to meal patterns*, $U = 57$, $z = -2.61$, $p = 0.009$. Women experienced this more than men, but neither ranked this item in their top five frequently experienced stressors.

Comparing the rankings by professional grouping (see Table 6), all groups ranked *critical time constraints* as the most frequently experienced stressor. The only other stressor included in the top five by all professional groups, was *cooperation from other project stakeholders*.

Other noteworthy findings regarding the ranking of the top five frequently experienced stressors included the following: only architects and QSs ranked *skewing of work-family life balance* and *long working hours required*; only architects and PCMs ranked *red tape levels encountered*; only engineers and QSs ranked *complexity of project problems*; only PCMs ranked *need to* 'prove' *oneself*; and only engineers included *level of professional skills required*.

The Kruskal–Wallis *H*-test for differences between professional groupings in frequently experienced stressors revealed only one significant difference, *leadership skills needed* (architects: $Md = 0$, $n = 9$; PCMs: $Md = 0$, $n = 7$; engineers: $Md = 0$, $n = 4$; and QSs: $Md = 0$, $n = 12$), χ^2 (3, $n = 32$) = 11.26, $p = 0.010$. Architects reported frequent experience of this stressor significantly more than did the other professionals.

Job control

A comparison of the rankings by gender (see Table 7) revealed that men and women ranked frequently experienced control items quite differently and only three (*volume of work*, *flow of work* and *type of work*) were included by both men and women in their top five.

Table 5 Five most frequently experienced Job Demand items – overall and by gender

Job demand item	Overall mean (±SE)	Rank	*n*	Male mean (±SE)	Rank	*n*	Female mean (±SE)	Rank	*n*
Critical time constraints	3.32 (±0.337)	1	34	3.54 (±0.404)	1	24	2.80 (±0.611)	1	10
Level of cooperation from other project stakeholders	1.77 (±0.343)	2	31	1.90 (±0.436)	2	21	1.50 (±0.563)	4	10
Long working hours required	1.45 (±0.328)	3	29	1.30 (±0.371)	4	20	1.78 (±0.683)	2	9
Critical cost constraints	1.42 (±0.321)	4	31	1.55 (±0.409)	3	22	1.11 (±0.484)	5	9
Complexity of project problems	1.04 (±0.311)	5	28	–	–	–	–	–	–
Red tape levels encountered	–	–	–	1.29 (±0.373)	5	21	–	–	–
Skewing of work-family life balance	–	–	–	–	–	–	1.56 (±0.784)	3	9

Table 6 Five most frequently experienced Job Demand items – overall and by profession

Job demand item	Overall mean (±SE)	Rank	*n*	Architect mean (±SE)	Rank	*n*	PCM mean (±SE)	Rank	*n*	Engineer mean (±SE)	Rank	*n*	QS mean (±SE)	Rank	*n*
Critical time constraints	3.32 (±0.337)	1	34	3.11 (±0.772)	1	9	3.38 (±0.498)	1	8	4.80 (±0.200)	1	5	2.83 (±0.649)	1	12
Level of cooperation from other project stakeholders	1.77 (±0.343)	2	31	2.50 (±0.681)	2	8	2.29 (±0.865)	2	7	1.50 (±0.645)	3	4	1.08 (±0.514)	4	12
Long working hours required	1.45 (±0.328)	3	29	1.67 (±0.919)	5	6	–	–	–	–	–	–	2.08 (±0.529)	2	12
Critical cost constraints	1.42 (±0.321)	4	31	–	–	–	1.63 (±0.800)	3	8	2.40 (±0.687)	2	5	1.00 (±0.477)	5	12
Complexity of project problems	1.04 (±0.311)	5	28	–	–	–	–	–	–	1.25 (±0.750)	5	4	1.58 (±0.596)	3	12
Level of professional skills required	–	–	–	–	–	–	–	–	–	1.40 (±0.980)	4	5	–	–	–
Red tape levels encountered	–	–	–	1.71 (±0.714)	4	7	1.62 (±0.680)	4	8	–	–	–	–	–	–
Need to 'prove' oneself	–	–	–	–	–	–	1.43 (±0.812)	5	7	–	–	–	–	–	–
Skewing of work-family life balance	–	–	–	2.20 (±1.020)	3	5	–	–	–	–	–	–	1.00 (±0.477)	5	12

Only women included control over *decision-making authority* and *ergonomics* and only men included control over *staff availability* and *staff competence*.

The Mann–Whitney *U*-test for differences between men and women revealed two, namely control over: *ergonomics* (men: $Md = 0$, $n = 19$; and women: $Md = 0$, $n = 9$; $U = 57$, $z = -2.62$, $p = 0.009$); and *staff availability* (males: $Md = 2$, $n = 20$; and females: $Md = 0$, $n = 9$; $U = 40$, $z = -2.56$, $p = 0.01$). The former indicates that women, significantly more than men, had frequently experienced control over *ergonomics* as having a moderating influence on job stressors, while the latter revealed that men, significantly more than women, had frequently experienced control over *staff availability* as a moderator of stress.

Comparing the rankings by professional grouping (see Table 8), it can be seen that none of the control items were ranked in the top five by all professional groupings. Control over *volume of work* and *flow of work* were both included in the top five by all professional groupings except PCMs; *staff competence* was included by all groupings except engineers; and *staff availability* was included by all groupings except architects.

The following Job Control items were included in the top five by only one professional grouping: *decision-making authority* (architects); *busyness and breaks* and *role conflict* (PCMs); and *power to delegate* (QSs).

The Kruskal–Wallis *H*-test found no significant differences between professional groupings.

Job Support

Comparing the rankings by gender (see Table 9), men and women ranked the top five frequently experienced support items differently and only two items (*co-worker support* and *adequate compensation (salary)*) were included in the top five by both men and women.

Only women included *recognition from others*, *absence of personal/family issues* and *supervisor competence*, and only men included *co-worker competence*, *fairness of criticism from others* and *appropriate career path potential*. The Mann–Whitney *U*-test found no significant differences between men and women.

Comparing the rankings by professional grouping (see Table 10), it can be seen that no control item was ranked in the top five by all professional groupings.

Co-worker support and *adequate compensation (salary)* were included in the top five by all groupings except PCMs; *co-worker competence* was only included by PCMs and QSs; *fairness of criticism from others* was only included by architects and PCMs; and *appropriate career path potential* was only included by engineers and QSs. The following items (see Table 10) were each only included by one professional grouping: *supervisor competence* and *opportunities for skills enhancement* (architects); *supervisor interpersonal skills, positive job security* and *freedom from health issues* (PCMs); *recognition from others* and *supervisor support* (engineers); and *absence of personal/family issues* (QSs). The Kruskal–Wallis *H*-test did not find any significant differences between professional groupings.

Impact scores

The highest ranked items in terms of 'impact scores' (see Table 11) were *critical time constraints* (Job Demands); *volume of work* (Job Control); and *adequate compensation (salary)* (Job Support).

The Mann–Whitney *U*-test revealed one significant difference between men and women for Job Demands, where women ($Md = 0$, $n = 9$), more than did men ($Md = 0$, $n = 19$), found *disruption to meal patterns*, $U = 57$, $z = -2.61$, $p = 0.09$, to be a cause of stress. A Kruskal–Wallis *H*-test found one significant and one noteworthy difference among professional groups. Respectively, these were *leadership skills needed* (architects: $Md = 0$, $n = 9$; PCMs: $Md = 0$, $n = 9$; engineers: $Md = 0$, $n = 9$; and QSs: $Md = 0$, $n = 9$), χ^2 (3, $n = 32$) = 11.26, $p = 0.01$, where architects found this to be a greater stressor than the other professional groupings; and *need to 'prove' oneself* (architects: $Md = 0$, $n = 5$; PCMs: $Md = 0$, $n = 7$; engineers: $Md = 0$, $n = 4$; and

Table 7 Five most frequently experienced Job Control items – overall and by gender

Job control item	Overall mean (±SE)	Rank	*n*	Male mean (±SE)	Rank	*n*	Female mean (±SE)	Rank	*n*
Volume of work	1.74 (±0.226)	1	31	1.55 (±0.277)	3	22	2.22 (±0.619)	1	9
Staff competence	1.55 (±0.265)	2	33	1.65 (±0.299)	2	23	–	–	–
Flow of work	1.48 (±0.282)	3	33	1.17 (±0.272)	5	23	2.20 (±0.663)	2	10
Staff availability	1.48 (±0.324)	4	29	2.00 (±0.397)	1	20	–	–	–
Type of work	1.41 (±0.330)	5	32	1.36 (±0.403)	4	22	1.50 (±0.601)	4	10
Decision-making authority	–	–	–	–	–	–	2.20 (±0.646)	3	10
Ergonomics	–	–	–	–	–	–	1.33 (±0.667)	5	9

Table 8 Five most frequently experienced Job Control items – overall and by profession

Job control item	Overall mean (±SE)	Rank	*n*	Architect mean (±SE)	Rank	*n*	PCM mean (±SE)	Rank	*n*	Engineer mean (±SE)	Rank	*n*	QS mean (±SE)	Rank	*n*
Volume of work	1.74 (±0.226)	1	31	1.88 (±0.611)	4	8	–	–	–	1.25 (±0.479)	5	4	2.17 (±0.458)	1	12
Staff competence	1.55 (±0.265)	2	33	1.89 (±0.484)	3	9	1.57 (±0.751)	3	7	–	–	–	1.58 (±0.452)	3	12
Flow of work	1.48 (±0.282)	3	33	2.00 (±0.577)	2	9	–	–	–	1.75 (±1.180)	4	4	1.50 (±0.469)	4	12
Staff availability	1.48 (±0.324)	4	29	–	–	–	1.25 (±0.559)	5	8	1.75 (±1.030)	3	4	1.58 (±0.543)	3	12
Type of work	1.41 (±0.330)	5	32	–	–	–	1.71 (±0.892)	2	7	2.00 (±0.913)	2	4	–	–	–
Decision-making authority	–	–	–	2.50 (±0.655)	1	8	–	–	–	–	–	–	–	–	–
Physical environment	–	–	–	1.60 (±0.927)	5	5	–	–	–	2.50 (±1.44)	1	4	–	–	–
Busyness and breaks	–	–	–	–	–	–	1.86 (±0.911)	1	7	–	–	–	–	–	–
Role conflict	–	–	–	–	–	–	1.29 (±0.837)	4	7	–	–	–	–	–	–
Power to delegate	–	–	–	–	–	–	–	–	–	–	–	–	1.17 (±0.575)	5	12

Table 9 Five most frequently experienced Job Support items – overall and by gender

Job support item	Overall mean (±SE)	Rank	*n*	Male mean (±SE)	Rank	*n*	Female mean (±SE)	Rank	*n*
Co-worker support	1.48 (±0.337)	1	31	1.36 (±0.381)	4	22	1.78 (±0.722)	2	9
Adequate compensation (salary)	1.40 (±0.290)	2	30	1.14 (±0.311)	5	21	2.00 (±0.624)	1	9
Co-worker competence	1.39 (±0.250)	3	33	1.48 (±0.307)	2	23	–	–	–
Fairness of criticism from others	1.34 (±0.364)	4	32	1.65 (±0.447)	1	23	–	–	–
Appropriate career path potential	1.16 (±0.302)	5	32	1.39 (±0.354)	3	23	–	–	–
Recognition from others	–	–	–	–	–	–	1.56 (±0.709)	3	9
Absence of personal/family issues	–	–	–	–	–	–	1.44 (±0.530)	4	9
Supervisor competence	–	–	–	–	–	–	1.40 (±0.653)	5	10

QSs: $Md = 0$, $n = 12$), χ^2 (3, $n = 32$) = 7.54, $p = 0.056$, where PCMs found this to be a greater source of stress than did the other professional groupings.

A Mann–Whitney *U*-test revealed two significant differences between men and women for Job Control items, where men, more than did women, found *staff availability* (men: $Md = 7$, $n = 20$; women: $Md = 0$, $n = 9$), $U = 41$, $z = -2.49$, $p = 0.013$; and women, more than men, found *ergonomics* (women: $Md = 0$, $n = 9$; men: $Md = 0$, $n = 19$), $U = 57$, $z = -2.61$, $p = 0.009$; to be moderators of stress. The Kruskal–Wallis *H*-test found no significant differences in 'impact scores' between professional groupings.

One noteworthy difference regarding Job Support was highlighted by a Mann–Whitney *U*-test, which revealed that women ($Md = 5$, $n = 9$), more than did men ($Md = 0$, $n = 21$), regarded *absence of personal/family issues*, $U = 62$, $z = -1.75$, $p = 0.08$ to be a moderator of stress. The Kruskal–Wallis *H*-test found no significant differences in 'impact scores' between professional groupings.

Discussion

The main contributors to stress, in terms of their perceived importance, were *critical time constraints, level of cooperation from other project stakeholders, long working hours required, critical cost constraints, skewing of work-family life balance, red tape levels encountered* and *number of meetings required*. The first five of these items are mirrored in the computed 'impact scores' and the ranking of the first three items is identical. The main stressors can be characterized as pertaining to the job, relationships and work-life domains. It is important to make this distinction because different kinds of interventions would be needed to alleviate stress in each domain and only job-related stressors and, to some extent, work-life issues are capable of being influenced by employers. The highest ranking stressor in terms of perceived importance and frequency of experience, *critical time constraints*, is related to the nature of the job and could conceivably be ameliorated by employer intervention.

The main perceived stressors are largely consistent with the literature (Sutherland and Davidson, 1989; Chartered Institute of Building, 2006; Love *et al.*, 2010), with the exception of *skewing of work-family life balance,* the ranking of which was not expected to be as high. Sutherland and Davidson (1989) included this factor in a list of top ten stressors, ranked ninth. The Chartered Institute of Building (2006, p. 12) did not include it in the main survey instrument, but reported that it was raised as a '*commonly recurring factor*' by respondents commenting on items they felt had been excluded. Using the International Survey of Stress and Mental Health Survey (SWS Survey), Love *et al.* (2010, p. 655) found that items relating to work-life balance (*must worry about my work even when not at work*; *work interferes with other things I must do*) were relatively weighty stressors. A possible inference is that poor work-family life balance is becoming a more chronic stressor, or that this finding is peculiar to the small sample in the current study, where it was ranked fifth ($M = 3.4$, Table 2). Considering this in context, 'critical cost constraints' was ranked higher than this (fourth) ($M = 3.42$), which was expected from the literature (Love *et al.*, 2010). However, the adjacent lower ranked items were 'red tape levels encountered' ($M = 3.11$), 'number of meetings required' ($M = 3.03$), 'complexity of project problems' ($M = 2.94$) and 'task frustrations' ($M = 2.92$), all of which relate to factors intrinsic to the nature of the work. It is important to note they were all ranked lower as contributors to workplace stress than was *skewing of work-family life balance.*

The analysis by gender of the perceived importance of stressors suggested that the higher than expected ranking of *skewing of work-family life balance* was influenced by women's perceptions, given that the only significant differences (see Table 2) between men and women lay in three items which all relate to work-family life balance (disruption to meal patterns, leisure

Table 10 Five most frequently experienced Job Support items – overall and by profession

Job support item	Overall mean (±SE)	Rank	*n*	Architect mean (±SE)	Rank	*n*	PCM mean (±SE)	Rank	*n*	Engineer mean (±SE)	Rank	*n*	QS mean (±SE)	Rank	*n*
Co-worker support	1.48 (±0.337)	1	31	1.67 (±0.645)	1	9	–	–	–	2.50 (±1.041)	1	4	1.67 (±0.555)	1	12
Adequate compensation (salary)	1.40 (±0.290)	2	30	1.50 (±0.957)	3	6	–	–	–	2.40 (±0.927)	2	5	1.33 (±0.432)	4	12
Co-worker competence	1.39 (±0.250)	3	33	–	–	–	1.37 (±0.460)	4	8	–	–	–	1.42 (±0.398)	2	12
Fairness of criticism from others	1.34 (±0.364)	4	32	1.50 (±0.756)	4	8	2.25 (±0.861)	1	8	–	–	–	–	–	–
Appropriate career path potential	1.16 (±0.302)	5	32	–	–	–	–	–	–	1.80 (±0.970)	5	5	1.42 (±0.570)	3	12
Supervisor competence	–	–	–	1.63 (±0.800)	2	8	–	–	–	–	–	–	–	–	–
Opportunities for skills enhancement	–	–	–	1.50 (±0.957)	5	6	–	–	–	–	–	–	–	–	–
Supervisor interpersonal skills	–	–	–	–	–	–	2.00 (±0.951)	2	7	–	–	–	–	–	–
Positive job security	–	–	–	–	–	–	1.43 (±0.528)	3	7	–	–	–	–	–	–
Freedom from health issues	–	–	–	–	–	–	1.29 (±0.644)	5	7	–	–	–	–	–	–
Recognition from others	–	–	–	–	–	–	–	–	–	2.00 (±1.155)	3	4	–	–	–
Supervisor support	–	–	–	–	–	–	–	–	–	1.80 (±0.735)	4	5	–	–	–
Absence of personal/family issues	–	–	–	–	–	–	–	–	–	–	–	–	1.33 (±0.497)	5	12

Table 11 Impact score rankings

Job demand item	Mean (±SE)	Rank	Job control item	Mean (±SE)	Rank	Job support item	Mean (±SE)	Rank
Critical time constraints	14.88 (±1.676)	**1**	Flow of work	5.45 (±1.151)	**3**	Co-worker competence	5.15 (±1.065)	**2**
Critical cost constraints	6.19 (±1.510)	**4**	Volume of work	6.19 (±0.822)	**1**	Supervisor competence	4.06 (±1.226)	**4**
High-level reporting demands	2.23 (±1.005)	9	Type of work	5.03 (±1.250)	**5**	Co-worker support	3.71 (±0.899)	6
Reporting frequency demands	0.38 (±0.213)	23	Physical environment	3.52 (±1.228)	8	Supervisor support	3.73 (±1.296)	**5**
Complexity of project problems	3.79 (±1.267)	7	Power to delegate	3.13 (±1.013)	9	Co-worker interpersonal skills	2.29 (±0.747)	13
Adequacy of technical resources (ICT, etc.)	2.14 (±1.016)	11	Ergonomics	1.57 (±0.905)	17	Supervisor interpersonal skills	3.30 (±1.159)	10
Task frustrations (interruptions)	2.00 (±0.981)	13	Decision-making authority	4.55 (±1.151)	6	Fairness of criticism from others	4.34 (±1.260)	**3**
Level of cooperation from other project stakeholders	8.00 (±1.581)	**2**	Decision latitude	1.67 (±0.781)	16	Recognition from others	3.10 (±1.043)	11
Level of professional skills required	1.57 (±0.805)	15	Staff availability	5.17 (±1.213)	**4**	Freedom to speak openly	1.77 (±0.931)	16
Amount of professional experience required	1.14 (±0.819)	20	Staff competence	6.06 (±1.084)	**2**	Opportunities for skills enhancement	1.97 (±0.913)	15
High-level meetings required	2.23 (±0.960)	9	Team size/composition	3.10 (±1.084)	10	Positive job security	3.38 (±0.777)	9
Number of meetings required	2.48 (±0.836)	8	ICT resources	2.87 (±1.227)	11	Adequate compensation (salary)	5.53 (±1.091)	**1**
Leadership skills needed	1.44 (±0.868)	16	Busyness and breaks	3.67 (±1.295)	7	Appropriate career path potential	3.69 (±0.988)	7
Number of other staff involved	0.18 (±0.179)	25	Work travel	1.97 (±0.967)	14	Freedom from health issues	2.55 (±0.897)	12
Information processing level required	1.17 (±0.607)	19	Role conflict	2.57 (±1.316)	12	Absence of personal/family issues	3.47 (±1.101)	8
Long working hours required	6.66 (±1.548)	**3**	Forced redeployment	1.14 (±0.819)	18	Absence of harassment at work	0.00 (±0.000)	17
Interpersonal skills required	0.55 (±0.431)	22	Forced relocation	0.43 (±0.429)	19	Absence of discrimination at work	2.26 (±1.108)	14
Red tape levels encountered	4.23 (±1.212)	6	Forced shift-work	2.43 (±1.228)	13			
ICT competence level required	0.71 (±0.471)	21	Forced termination	1.79 (±0.899)	15			
Need to 'prove' oneself	2.14 (±1.160)	11						
Skewing of work-family life balance	4.79 (±1.496)	**5**						
Job travel demands	0.28 (±0.276)	24						
Disruption to meal patterns	1.21 (±0.784)	17						
Disruption to leisure activities	1.79 (±0.964)	14						
Disruption to sports/exercise activities	1.18 (±0.681)	18						

Note: Bold values indicate items ranked in the top 5, as well as values that are statistically significant.

activities and sports/exercise activities). Similarly, only women included *skewing of work-family life balance*, ranked third, in their five most frequently experienced stressors (see Table 5). Bowen *et al.* (2013) reported a general inability of construction professionals to successfully balance work-family responsibilities, but noted that there was no significant difference between men and women in this regard. Given the overrepresentation of women in their considerably larger sample, where there ought to have been a greater chance of discovering a gender bias, the findings of the current study should be viewed with caution. In the development of future scales, this issue should be responded to by the inclusion of items that are likely to capture a more nuanced view of how women experience poor work-life balance as a stressor, regardless of the likely ranking of this factor. Analysing the data by professional grouping, no significant differences were found between the groups regarding the perceived importance of stressors (see Table 2). However, differences emerged when the ranking of items was considered in terms of frequency of experience. All professional groupings, except architects, included *critical cost constraints* in their top five, which suggests that architects are typically good at designing to budget, or that QSs typically provide sufficient contingencies to accommodate uncertainties in the design process. Only engineers ranked *level of professional skill required* and only PCMs ranked *need to* 'prove' *oneself* in their five most frequently experienced stressors. The former finding is surprising, as one would expect both engineers and architects to have reported this, given their design roles, but architects only ranked this item eighteenth, whereas engineers ranked it fourth. The latter is not surprising because PCMs have the greatest involvement in planning and delivering against project programmes. Only architects and QSs included *skewing of work-family life balance* in their top five most frequently experienced stressors, suggesting that there is typically considerable pressure in the pre-contract stage, where these two professions work closely together, to produce tender documents against tight deadlines. The finding that only these two groupings included *long work hours* in their top five most frequently experienced stressors supports this inference, but contradicts the finding of Bowen *et al.* (2013) that, compared with other professional groupings, proportionally more engineers reported having to work long hours.

Control over *volume of work*, *staff competence*, *flow of work*, *type of work* and *staff availability* were perceived as the main moderators of stress, in terms of both perceived importance and frequency of experience thereof (see Tables 3 and 7). The 'impact scores' mirrored these as the top five items, ranked in the same order as frequency of experience. All of these factors relate to work and the staff resources available to undertake it. This confirms the findings of Haynes and Love (2004) and Leung *et al.* (2007) with regard to workload, but highlights the importance of control over *type of work* and *work flow*, as well as over *staff availability* and *staff competence*.

The analysis by gender of the perceived importance of stress moderators suggested that control over *staff availability* was significantly more important to men than it was to women (see Table 3). This was mirrored in the analysis of the 'impact scores' and is possibly due to the predominance of men in senior management positions in construction industry professional practices (Dainty, Bagilhole *et al.*, 2000; Dainty, Neale *et al.*, 2000; Bowen *et al.*, 2013; Martin and Barnard, 2013). Other factors that affect women differently emerged when the ranking of items was considered in terms of frequency of experience, where it was found that women included control over *decision-making authority* and *ergonomics* in their top 5 (see Table 7), but men did not. Considering differences between professional groupings, control over both *physical environment* and *forced relocation* is significantly more important to PCMs than the other groups (see Table 3). The reason for this may lie in the nature of their work, in that some work assignments have the potential to be less attractive than others, e.g. rural or remote site locations. Interestingly, no single Job Control item was included by all professional groupings in the ranking of frequently experienced stress moderators. The following items were each included by only one of the professional groupings: *decision-making authority* and *physical environment* (architects); *busyness and breaks* and *role conflict* (PCMs); and *power to delegate* (QSs). This aligns with Bowen *et al.* (2013), who noted that architects experience less control over the physical environment than do the other professional groupings.

The main Job Support items perceived to be important in the moderation of stress were *adequate compensation (salary)*, *co-worker competence*, *positive job security*, *supervisor competence* and *appropriate career path potential* (see Table 4). These align with Leung *et al.* (2007) regarding the negative effects of low levels of reward, and Ng *et al.* (2005) concerning a lack of opportunity to learn new skills in terms of career path development, as well as a lack of autonomy in decision-making. The highest ranked frequently experienced support moderators (see Table 9) differ from these items by the exclusion of *positive job security* and *supervisor competence*, and the inclusion of *co-worker support* and *fairness of criticism from others* (see Table 12). The inclusion of *co-worker support* might be explained by Mayo *et al.*'s (2012) finding that the buffering effect of co-worker support varies depending on context. The 'impact score' rankings introduce *supervisor support* as a high-ranking

Table 12 Comparison of ranking of five highest ranked items: perceived importance, frequency of experience and impact scores

Perception of importance	Frequency of experience	Impact score
Five top ranked Demand items (See Table 2)	*Five top ranked Demand items* (See Table 5)	*Five top ranked Demand items* (See Table 11)
1. Critical time constraints	1. Critical time constraints	1. Critical time constraints
2. Level of cooperation from other project stakeholders[a]	2. Level of cooperation from other project stakeholders[a]	2. Level of cooperation from other project stakeholders[a]
3. Long working hours required	3. Long working hours required	3. Long working hours required
4. Critical cost constraints[a]	4. Critical cost constraints[a]	4. Critical cost constraints[a]
5. Skewing of work-family life balance	5. Complexity of project problems[a]	5. Skewing of work-family life balance
Five top ranked Control items (See Table 3)	*Five top ranked Control items* (See Table 7)	*Five top ranked Control items* (See Table 11)
1. Volume of work[a]	1. Volume of work[a]	1. Volume of work[a]
2. Staff competence[a]	2. Staff competence[a]	2. Staff competence[a]
3. Flow of work	3. Flow of work	3. Flow of work
4. Type of work	5. Type of work	5. Type of work
5. Staff availability	4. Staff availability[a]	4. Staff availability[a]
Five top ranked Support items (See Table 4)	*Five top ranked Support items* (See Table 9)	*Five top ranked Support items* (See Table 11)
1. Adequate compensation (salary)	2. Adequate compensation (salary)	1. Adequate compensation (salary)
2. Co-worker competence[a]	3. Co-worker competence[a]	2. Co-worker competence[a]
3. Positive job security		
4. Supervisor competence[a]		4. Supervisor competence[a]
4. Appropriate career path potential	5. Appropriate career path potential	
	1. Co-worker support	3. Fairness of criticism from others[a]
	4. Fairness of criticism from others[a]	5. Supervisor support

[a]Not included in the Bowen *et al.* (2013) survey.

moderator, which supports Taylor's (2008) finding regarding the positive buffering effect of supervisor support. Here, it can be seen that the use of 'impact scores' causes an item to move up the ranking, revealing a relative importance that might otherwise have been overlooked.

No significant differences were found between men and women regarding the perceived importance of support moderators, but only women ranked *recognition from others, absence of personal/family issues* and *supervisor competence* (see Table 9) in their top 5. This supports the characterization of women in the construction sector as typically occupying non-managerial, supportive roles (Dainty, Bagilhole *et al.*, 2000; Dainty, Neale *et al.*, 2000; Martin and Barnard, 2013). A noteworthy difference between women and men was, however, observed in the analysis of the 'impact scores', with women regarding the *absence of personal/family issues* to be more of a moderator of stress. Analysing the data by professional grouping, no significant differences were found between the groups (see Table 4). Eight different support items were each selected by only one of the professional groupings (see Table 10), but no clear inference can be drawn from this. The analysis shows that the higher ranking for *supervisor support* in the 'impact score' ranking is due to engineers' experience of it.

Reflecting on the research method, which involved asking respondents to rank both the perceived importance of demand, control and support factors and the frequency of their experience of the same factors, it appears that there is value in doing so because the rankings differ. This can clearly be seen in Table 12, where items below the dotted line in each category in the 'Frequency of experience' and 'Impact score' columns are those that differ from the five highest ranked items in the 'Perception of importance' column. The differences were not major in terms of the number of items that changed or shifted in the ranking, but the mere inclusion or exclusion of an item is sufficient justification to consider the method more useful than having adopted only one of these approaches, especially if the purpose of identifying items is to inform intervention. Similarly, the re-ranking of items using 'impact scores' is considered more useful than not doing so, because it surfaces items that would otherwise have been considered less important, or would have gone unnoticed. Further, analysing the data by gender and

professional grouping is considered valuable because it allows a finer-grained interpretation of what informs the rankings and, therefore, the possibility of scoping interventions more precisely. Finally, the inclusion of additional items in the scales compared with the Bowen *et al.* (2013) study was successful in that the additional items not only attracted responses, but also several were ranked in the top five (see Table 12). This highlights the importance of selecting or developing appropriates scales.

Limitations of the current study

The current study is exploratory in nature and the sample size of 36 is relatively small. The findings should thus be interpreted with circumspection in terms of generalizability. Respondents were selected on the basis that they were registered professionals with at least five years of work experience, on the assumption that they would have been sufficiently exposed to job stressors and would have opinions about how they thought these could be moderated by control and support factors. Although the demographic profile of the sample was captured and reported, respondents' ages were not recorded. This is a limitation, because the experience of stressors and the ways in which people cope with them do appear to differ across age groups (Aldwin *et al.*, 1996).

The validity of the research instrument cannot be demonstrated because of the exploratory nature of the research. We intend to use the ranking exercise derived from the current study to refine the items for use in a future version of the scales, after which we intend to test for construct validity in terms of the JDC-S model. The psychometric properties of the scales will be tested using exploratory and confirmatory factor analyses.

The scope of the scales used in the current study excludes personal stressors, which have been identified in the literature (see, for example, Leung *et al.*, 2008) as a category of stressor. Personal stressors were not included in the original JCQ (Karasek, 1985) and are excluded from many stress studies on construction professionals and employees (Ng *et al.*, 2005; Meliá and Becerril, 2007; Sang *et al.*, 2007; Yip *et al.*, 2008; Ibem *et al.*, 2011; Leung and Chan, 2012; Chan, Leung *et al.*, 2012; Lingard *et al.*, 2012; Poon *et al.*, 2013; Leung, Bowen, *et al.*, 2015). Thus, the inclusion or exclusion of personality issues should be determined by the scope and purpose of the research. The purpose in this study was to identify stressors, control and support factors perceived as important and frequently experienced, and to understand how men and women and professional groups differ in such perceptions and experiences.

The design of research aimed at understanding stress among construction professionals in terms of gender and in the African context should carefully consider whether to use established or bespoke scales, particularly if they are unlikely to capture issues specific to these contexts. Further, it should be questioned whether scales and quantitative analyses alone can achieve such understanding, and recognition should be given to the value and potential of qualitative methods to provide a fuller picture, particularly where open-ended questioning is likely to surface issues not contemplated in scales.

Conclusions

The purpose of the current study was as follows: firstly, to identify the main demand, control and support factors perceived by construction industry professionals in South Africa; secondly, to determine whether differences exist between perceptions of these factors' importance and the frequency of respondents' experience thereof; thirdly, to identify differences in responses in terms of gender and professional grouping; and, finally, to test whether expanding the set of variables used in Bowen *et al.* (2013) would produce new information. These purposes were all achieved and they define the contributions of this study as follows.

The main stressors reflect the construction project environment as being time-pressured, complex, requiring cooperation between participants, and having a negative impact, particularly for women, on work-life balance. This is mirrored to some extent in the findings regarding job control, where control over the type, flow and volume of work, which are all related to time pressure and complexity, are perceived and experienced as important moderators of stress, as are issues concerning the availability and competence of staff. Similarly, the findings regarding job support are related to the identified stressors. Here, it appears that expectations of high salaries and good career path opportunities are linked to time-pressure and long working hours; and the competence and support of co-workers and supervisors is linked to cooperation between participants.

The analysis by gender and professional grouping produced results that will influence how future studies are planned. Work-life balance issues emerged as high-ranking stressors, particularly for women, which leads to the conclusion that future scales should include items designed to capture the full breadth of the female experience of this stressor. Similarly, the experiences of women regarding the competence and availability of staff, decision-making authority, ergonomics and recognition from others as important moderators of stress suggests that scales should be designed to capture

how these factors are influential. It is less clear how the differences found between professional groupings should be responded to in designing future scales, since the differences found in the current study appear to reflect the nature of the work and/or organizational issues typical to the various disciplines. This leads to reflection on whether, or in what context, one should treat such a diverse population (i.e. construction professionals) as a single entity. A good justification for this would be if the unit of analysis were a project, in which the interconnectedness of participants' roles is established and evaluation of perceptions and experiences can occur with a view to informing how the planning and management of project teams can be improved to alleviate stress.

The approach adopted in the current study of measuring both perceptions of importance and frequency of experience of stressors and moderators was successful when the five highest ranked items in each scale are compared. Different items emerged in the Job Demand and Job Support scales and the top five items were ranked in a different order in all three scales. Although the differences were minor, the research demonstrated that there appear to be differences between perception and experience and this is something that should be carefully considered in the design of future scales. The use of 'impact scores' to re-weight rankings was a successful analytical tool in that it elevated the ranking of two items in the Job Support scale, which would have otherwise have been suppressed. Finally, although many of the additional items introduced to the scales used in Bowen *et al.* (2013) were arguably unnecessary, several of them were included in the five highest ranking items in all three of the scales used in the current study. This leads to the conclusion that established and validated scales should be used if they are known to measure what is being studied. If scales are developed for a study in a context where no validated scales exist, they should be constructed rigorously and accompanied by qualitative instruments capable of capturing issues through open-ended questioning. The research confirms the applicability of using the JDC-S framework, which found the main stressors, control and support moderators to be largely consistent with the findings of previous studies.

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