

WORK-RELATED STRAIN EFFECTS AND COPING STRATEGIES AMONG SOUTH AFRICAN CONSTRUCTION PROFESSIONALS

Rita Peihua Zhang¹, Paul Bowen² and Peter Edwards³

^{1&3} *School of Property, Construction and Project Management, RMIT University, GPO Box 2476, Melbourne, VIC 3001, Australia*

² *Department of Construction Economics and Management, University of Cape Town, Private Bag, Rondebosch 7700, Cape Town, South Africa*

The working environment in the construction industry is demanding and many construction professionals experience high levels of workplace stress, leading to physiological, psychological and sociological strain effects. The coping strategies that construction professionals adopt to manage work-related strain effects can be adaptive (e.g. physical and intellectual counter-measures) or maladaptive (e.g. unhealthy lifestyle counter-measures). A purposively selected sample of thirty-six construction professionals were surveyed regarding their experiences of strain effects and coping strategies for mitigating them. Between-gender and between-professional group differences in experiences were also investigated. The highest-ranked physiological strain effects in terms of frequency of occurrence were fatigue, inability to relax, disturbed sleep patterns, skeleton-muscular pain, and headaches. The psychological strain effects of frustration, anger / irritability, tenseness, anxiety, and feeling dissatisfied were most frequently experienced by construction professionals. Strain on professional relationships and strain on personal relationships were the highest ranked sociological strain effects in terms of frequency. Between-gender and between-professional group differences were identified for several strain effects across different categories. Regarding coping strategies, respondents reported non-competitive sporting activity, walking, competitive sporting activity, fitness classes, and shopping as the most effective physical counter-measures to stress. The intellectual counter-measures of travel, music appreciation, focussing on smaller tasks, reading and humour were ranked the highest in terms of effectiveness. With regard to maladaptive coping strategies, respondents ranked increased caffeine intake and confrontation as most effective counter-measures. Between-gender and between-professional group differences were identified in the rating of some physical and intellectual counter-measures, but not in the rating of lifestyle counter-measures. The research contributes to the understanding of strain effects of workplace stress on construction professionals and provides important implications for the development of targeted stress-management strategies within professional practices and construction organisations.

Keywords: workplace stress, strain effects, stress coping, professionals

¹ rita.zhang@rmit.edu.au

INTRODUCTION

Workplace stress is defined as an “adverse reaction people have to excessive pressures or other types of demand placed on them” (Health and Safety Executive (HSE), 2019a; p.3). Workplace stress has been recognised as a threat to the health and wellbeing of working people across the world. For example, in the Fourth Working Conditions Survey, stress was reported as one of the most frequently reported work-related health issues and experienced by 22.3% of working individuals across EU27 countries (European Foundation for the Improvement of Living and Working Conditions, 2007). Workplace stress is a major cause of occupational ill-health, which can lead to severe physical and psychological symptoms being experienced by employees (HSE, 2019a). Workplace stress is also associated with production lost and massive costs. According to HSE (2019b), 12.8 million working days were lost due to work stress, depression or anxiety, which was equivalent to 54% of all working days lost due to ill-health during 2018-2019 in the UK.

The construction industry is a high-risk sector in terms of work stress (Love *et al.*, 2010). Construction professionals work with restricted project budgets and tight schedules, and project delays can lead to considerable financial penalties (Lingard and Francis, 2004). Construction work is associated with high levels of dynamism and uncertainty, elevating its stressful nature (Mohr and Wolfram, 2010). A survey conducted by Campbell (2006) indicates that 61.9% of construction professionals who participated in the survey reported suffering from workplace stress.

Previous research found that the levels of stress experienced by construction professionals vary according to organisation type (i.e. contracting or consultancy companies) (Love *et al.*, 2010), gender (Sunindijo and Kamardeen, 2017) and professional groups (Bowen *et al.*, 2014b). These findings suggest that a more finely grained analysis is required to understand differences in the stress experiences of construction professionals and to develop targeted stress coping measures. Ongoing research is being conducted to examine workplace stress experiences among South African construction professionals. This paper reports research findings in relation to construction professionals' experiences of strain effects and stress coping strategies and associated between-gender and between-professional group differences.

THEORETICAL FRAMEWORK

Stress is used as an umbrella term that encompasses a range of environmental demands (i.e. stressors), the effects of stress (i.e. strains), and intervening variables that influence the relationship between stressors and strains (e.g. coping strategies and mechanisms, environmental support) (Jones and Bright, 2001). Hence, stress results from an imbalance between demands and personal or environmental resources (Houtman, 2005). Strain effects are therefore responses to the negative outcomes of stress (Jones and Bright, 2001). Strain effects are manifested differently. For example, Houtman (2005) identified four types of strain effects, including: physiological (e.g. headaches, cardiovascular disease), psychological/emotional (e.g. feeling nervous or irritated, depression, anxiety), cognitive (e.g. poorer quality decision-making, impaired memory), and behavioural (e.g. substance abuse, impulsive behaviours). Osipow and Davis (1988) added that stress stimuli (the pressures) can also lead to interpersonal strain effects which produce disruptions in interpersonal relationships, and vocational strains which negatively impact work performance. In addition, Bowen *et al.*, (2014b) described sociological strain effects as negative effects on individuals' family life, social activities, and social relationships. Coping

strategies might comprise a suite of individual coping mechanisms, each of which might have positive (adaptive) or negative (maladaptive) health outcomes.

In the construction industry, research has reported a variety of negative strain effects of workplace stress. For instance, Leung *et al.*, (2011) reported that construction project managers who experience job-related stress (e.g. stress relating to meeting project deadlines) are likely to show the psychological response of burnout, which further leads to physiological strain effect symptoms such as headaches, migraines, back pain, and loss of appetite. In addition, job-related stress is also shown to negatively impact on construction project managers' work performance and interpersonal relationships (Leung *et al.*, 2011). Bowen *et al.*, (2014a) examined psychological, physiological and sociological strain effects in the South African construction industry. They reported that these three types of strain effects are interrelated and either directly or indirectly predicted by personal factors (e.g. age, experience), workplace factors (e.g. job demand), and contextual factors (e.g. organisational climate).

Coping has been defined as “cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (Lazarus, 1993; p 237). One way of classifying coping mechanisms is referring to a health promotion paradigm (Holton *et al.*, 2016). Following this paradigm, a coping mechanism can be evaluated based on its adaptive (protective) or maladaptive (detrimental) effect on an individual's health. Adaptive coping strategies are those used by individuals to deal with stressors in a positive and healthy way, such as exercise, meditation, and seeking social support. Maladaptive coping strategies, on the other hand, may temporarily reduce strain symptoms but potentially lead to greater health issues and contribute to the development of coping vulnerabilities, such as excessive consumption of alcohol, drug use, and habitual rumination (Holton *et al.*, 2016). Bowen *et al.*, (2014b) examined the coping mechanisms used by construction professionals and reported that although professionals adopt a range of adaptive coping mechanisms (e.g. physical, intellectual and cultural activities) to deal with stress, the use of maladaptive coping mechanisms (i.e. alcohol consumption, smoking, and the use of narcotics) is also common.

RESEARCH METHOD

This research was conducted using a questionnaire survey. The workplace strain effects section of the survey comprised scales for Physiological Strain Effects (15 items), Psychological Strain Effects (13 items), and Sociological Strain Effects (6 items) (see Table 1). The counter-measures section comprised scales for Physical Counter-measures (17 items), Intellectual Counter-measures (25 items), and Lifestyle Counter-measures (10 items) (see Table 2). The Physical and Intellectual Counter-measures are related to adaptive coping mechanisms while the Lifestyle Counter-measures are related to maladaptive coping mechanisms.

Purposive sampling was employed to identify suitable respondents, thus ensuring representation of professional disciplines and both genders (Patton, 2002). The target frame consisted of professionals working in the construction industry in the Western Cape, largely drawn from the metropolitan area of Cape Town. Respondents were selected on the basis that they were registered with a professional Council with at least 5 years post-registration work experience. Thirty-six respondents completed the survey. The demographic characteristics of the sample were: 11 architects (7 males, 4

females); 8 project/construction managers (PCM) (7 males, 1 female); 5 engineers (4 males, 1 female); and 12 quantity surveyors (QS) (7 males, 5 females).

For each of the three strain effects scales, respondents were asked to select five most frequently experienced items and rank the five items in terms of frequency based on their experience. A five-point frequency scale with interval definitions was given for the rating of each item (1=barely noticeable or least frequently experienced; 5=very intense or most frequently experienced). For each of the three counter-measure scales, respondents were asked to select five items that they would prefer to use and rank the five items in terms of effectiveness according to their experience. Again, a five-point frequency scale with interval definitions was given for the rating of each item (1=ineffective at relieving stress or not at all effective in providing relief to me; 5=very effective at relieving stress or the most effective in providing relief to me).

RESULTS

The reliability of the instrument was tested. For the strain effects scales, the Cronbach's alpha for the Physiological, Psychological, and Sociological strain effects scales was 0.86, 0.88, and 0.70, respectively. For the counter-measures scales, the alpha value for the Physical, Intellectual, and Lifestyle scales was 0.75, 0.87, and 0.81, respectively. These alpha values indicated good to very good internal consistency in each set. Means values were calculated to identify the most frequently experienced strain effects and most effective counter-measures. Given the small sample size, the use of non-parametric statistical analyses was considered appropriate (Corder and Foreman, 2014). 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 (Corder and Foreman, 2014). The test results are not presented in detail here.

Frequency of occurrence of physical strain effects

The five most frequently experienced physiological strain effects were fatigue, an inability to relax, disturbed sleep patterns, musculoskeletal pain, and headaches (see Table 1). A Mann-Whitney U Test showed two significant differences between men and women regarding the frequency of occurrence of these five strain effects. Men reported fatigue as being significantly more frequently experienced than did women. Women experienced proneness to accidents significantly more than did men. The Kruskal-Wallis H Test did not reveal any significant difference between professional groups.

Frequency of occurrence of psychological strain effects

The five most frequently experienced psychological strain effects were frustration, anger / irritability, tension, anxiety, and feeling dissatisfied (see Table 1). The Mann-Whitney U Test for differences between men and women revealed three significant differences, namely, frustration; lack of self-confidence; and feeling useless. Men, significantly more than women, had frequently experienced frustration, but women, significantly more than men, had frequently experienced lack of self-confidence and feeling useless. The Kruskal-Wallis H Test found a significant difference between professional groups with respect to anxiety. Architects reported this effect more frequently than did the other groups.

Frequency of occurrence of sociological strain effects

The five most frequently experienced sociological strain effects were strained personal relationships, strained professional relationships, an unwillingness to meet people, an

unwillingness to discuss issues, and an intention to leave (see Table 1). The Mann-Whitney U Test for differences between men and women revealed one significant difference, namely, strain on professional relationships. Women experienced this effect more frequently than did men. The Kruskal-Wallis H Test did not find any significant differences between professional groups.

Table 1: Item catalogues for workplace strain effects and frequency of occurrence

Item	Physiological strain effects			Psychological strain effects			Sociological strain effects		
	Variables	Frequency		Variables	Frequency		Variables	Frequency	
		Mean (±SE)	Rank		Mean (±SE)	Rank		Mean (±SE)	Rank
1.	Disturbed sleep patterns	2.32 (±0.312)	3	Tenseness	2.17 (±0.327)	3	Strain on personal relationships	3.69 (±0.268)	1
2.	Nausea sensations	0.11 (±0.079)		Anger, irritability	2.45 (±0.343)	2	Strain on professional relationships	3.49 (±0.273)	2
3.	Stomach upset	0.61 (±0.264)		Frustration	2.86 (±0.304)	1	Unwillingness to meet people	2.24 (±0.292)	3
4.	Headaches	1.76 (±0.317)	5	Anxiety	1.79 (±0.312)	4	Unwillingness to discuss issues	2.15 (±0.235)	4
5.	Fatigue	3.15 (±0.317)	1	Feeling resentful	0.31 (±0.165)		Intention to leave	1.90 (±0.302)	5
6.	Daytime drowsiness	0.83 (±0.263)		Feeling unhappy	0.72 (±0.237)		Contemplating legal action	0.52 (±0.236)	
7.	Unable to concentrate	1.00 (±0.282)		Feeling depressed	0.24 (±0.137)				
8.	Unable to relax	2.53 (±0.317)	2	Lack of self-confidence	0.18 (±0.146)				
9.	Eyesight problems	1.16 (±0.291)		Feeling useless	0.25 (±0.190)				
10.	Musculoskeletal pain	2.16 (±0.341)	4	Feeling dissatisfied	1.26 (±0.266)	5			
11.	Hypertension	0.32 (±0.156)		Feeling unappreciated	0.66 (±0.229)				
12.	Decreased libido	0.25 (±0.151)		Assigning blame to others	0.18 (±0.179)				
13.	Hot / cold flushes	0.21 (±0.144)		Mood swings more frequent	0.90 (±0.277)				
14.	Increased absenteeism	0.11 (±0.079)							
15.	Proneness to accidents	0.21 (±0.157)							
	Chronbach's Alpha = 0.858			Chronbach's Alpha = 0.879			Chronbach's Alpha = 0.702		

Effectiveness of counter-measures

Effectiveness of adaptive physical counter-measures

The five most effective physical counter-measures used by participants were non-competitive sporting activity, walking, competitive sporting activity, fitness classes, and shopping (see Table 2). The Mann-Whitney U Test for differences between men and women revealed two significant differences, namely, walking and dancing. Women found both of these activities to be beneficial more frequently than did men. The Kruskal-Wallis H Test did not identify any significant difference between professional groups.

Effectiveness of adaptive intellectual counter-measures

The five most effective intellectual counter-measures experienced by participants were travel, music appreciation, focussing on smaller, more manageable tasks, reading and humour (see Table 2). The Mann-Whitney U Test for differences between men and women revealed one significant difference, namely, painting and sketching. Women found this activity to be beneficial more frequently than did men. The Kruskal-Wallis H Test identified significant differences between professional groups in respect of music appreciation, watching TV, and painting and sketching. In all three instances, architects experienced the therapeutic effects of these pastimes significantly more frequently than did the other groups.

Table 2: Item catalogues for stress counter-measures and effectiveness

Item	Physical counter-measures			Intellectual counter-measures			Lifestyle counter-measures		
	Variables	Effectiveness Mean (±SE)	Rank	Variables	Effectiveness Mean (±SE)	Rank	Variables	Effectiveness Mean (±SE)	Rank
1.	Competitive sporting activity	1.59 (±0.418)	3	Adopt formal problem-solving routine	1.33 (±0.369)		Increased caffeine intake	2.61 (±0.361)	1
2.	Non-competitive sporting activity	2.35 (±0.381)	1	Focus on smaller, manageable tasks	1.76 (±0.393)	3	Increased use of alcohol	1.48 (±0.314)	5
3.	Walking	2.24 (±0.348)	2	Reading & book clubs	1.61 (±0.367)	4	Increased use of tobacco	0.72 (±0.280)	
4.	Fitness classes	1.52 (±0.332)	4	Pastimes (cards, chess, etc.)	0.14 (±0.143)		Increased use of other stimulants	0.24 (±0.137)	
5.	Climbing	0.59 (±0.189)		Music (listening, attending performance)	1.88 (±0.294)	2	Increased gambling	0.14 (±0.108)	
6.	Orienteering	0.07 (±0.074)		Crosswords, Sudoku, word games	0.64 (±0.258)		Food addictions & over-eating	1.84 (±0.356)	4
7.	Dancing	0.86 (±0.303)		Travel	2.55 (±0.335)	1	Confrontation	2.58 (±0.340)	2
8.	Gardening	1.33 (±0.281)		Computer games	0.32 (±0.206)		"Distancing/Escape/Avoidance" actions	2.38 (±0.359)	3
9.	Woodworking	0.43 (±0.190)		TV	1.52 (±0.324)		Prescription medication	0.31 (±0.193)	
10.	Home Maintenance	0.64 (±0.199)		Radio	0.76 (±0.226)		Non-prescription medication	0.86 (±0.237)	
11.	Home Improvement	0.97 (±0.268)		Music performance (instrument, choir)	0.10 (±0.103)				
12.	Motoring	0.93 (±0.317)		Theatre/opera/ballet (attending)	0.76 (±0.256)				
13.	Cycling	0.63 (±0.268)		Theatre (performing arts)	0.24 (±0.107)				
14.	Motor-cycling	0.19 (±0.192)		Writing	0.20 (±0.147)				
15.	Inter-active computer sports (e.g., Wii)	0.57 (±0.244)		Painting, sketching	0.20 (±0.121)				
16.	Shopping	1.38 (±0.308)	5	Debating	0.17 (±0.141)				
17.	Window shopping	0.30 (±0.183)		Volunteering	0.11 (±0.107)				
18.				Photography & Visual media	0.52 (±0.236)				
19.				Sculpting	0.00 (±0.000)				
20.				Pottery	0.00 (±0.000)				
21.				Craftwork	0.29 (±0.155)				
22.				Antiques and collecting	0.37 (±0.200)				
23.				Humour	1.61 (±0.333)	4			
24.				Local politics	0.18 (±0.179)				
25.				National politics	0.00 (±0.000)				

Chronbach's Alpha = 0.750 Chronbach's Alpha = 0.874 Chronbach's Alpha = 0.808

Effectiveness of maladaptive lifestyle counter-measures

The five most effective maladaptive lifestyle counter-measures experienced by participants were increased caffeine intake, confrontation, distancing / avoidance actions, over-eating, and increased alcohol consumption. The Mann-Whitney U Test did not reveal any significant difference between men and women in maladaptive lifestyle counter-measures. The Kruskal-Wallis H Test also failed to identify any significant differences between professional groups.

DISCUSSION

Strain effects

Fatigue was the highest-ranked physiological strain effect in terms of frequency of occurrence. Previous research shows that fatigue is a common complaint from construction professionals (Brown *et al.*, 2010). This can possibly be explained by the demanding characteristics of the construction industry, i.e., long work hours, high workload, tight project deadlines, and competitive tendering systems (Brown *et al.*, 2010). Such a work environment prevents construction professionals from adequate recovery, which is a key factor in fatigue and exhaustion (Sonntag *et al.*, 2010).

The between-gender analysis showed that male professionals experienced fatigue more frequently than did female professionals, while female professionals experienced more proneness to accidents compared to male professionals. Sunindijo and

Kamardeen (2017) reported that male professionals experienced physical stressors (e.g. unpredictable work hours) more often than did female professionals, which may lead male professionals to experience higher levels of fatigue than do female professionals. The reason why female professionals appear to be more prone to accidents at work compared to their male counterparts is more equivocal. The literature is silent on this matter, pointing to the need for future research in this regard.

The results in relation to psychological strain effects frequently experienced by construction professionals (i.e. frustration, anger and irritability, anxiety, tenseness, and feeling dissatisfied) are generally consistent with previous research such as Chan *et al.*, (2012). The between-gender analysis indicated that male professionals experienced frustration more frequently than did female professionals, but female professionals were more likely to experience lack of self-confidence and feeling useless than were male professionals. According to Loosemore and Waters (2004), generally more male professionals hold senior positions than female professionals in the construction industry, and thus male professionals tend to experience higher levels of stress in relation to managerial and relationship factors than do female professionals. This difference potentially explains why male professionals are more likely to experience frustration than are female professionals. On the other hand, female construction professionals often experience considerably more barriers to career progression than do their male counterparts (Dainty *et al.*, 2000). They tend to experience more gender and career advancement-related stressors compared to their male counterparts, such as being treated differently, bullying, lower rates of pay and underpromotion (Sunindijo and Kamardeen, 2017; Loosemore and Waters, 2004). The gender-specific stressors experienced by female construction professionals are likely to lead them to experience diminished self-confidence and self-esteem. The between-professional groups analysis showed that architects reported more frequent experience of the strain effect of anxiety than did the other professional groups. Research indicates that factors relating to the architectural profession could be contributing factors in mental health concerns, such as dysfunctional design teams, poor interpersonal relationships, and perceived career decline (Oyedele, 2013). Attention is also drawn to fact that limited research has investigated factors contributing to the declining mental health of architects.

The highest-ranked sociological strain effects in terms of frequency of experience were strain on personal relationships and strain on professional relationships. This result aligns with previous research finding that poorer quality of interpersonal relationships is a key outcome of workplace stress (Leung *et al.*, 2008). Female professionals reported significantly higher frequency of experiencing strain on professional relationships. This result resonates with research evidence that female construction professionals frequently experience stressors relating to professional relationships, such as poor relationships with superiors, social or physical isolation from others, and working with colleagues from the opposite sex (Sunindijo and Kamardeen, 2017; Loosemore and Waters, 2004). This perhaps reflects the male-dominant nature of the construction industry, which leads females to develop a sense of isolation and difference by working in the industry.

Counter-measures

The highest-ranked physical counter-measure in terms of perceived effectiveness and preference of use, is non-competitive sporting activity and walking. Similarly, Chan *et al.*, (2012) reported that exercising and going for walks were frequently used as coping strategies by expatriate construction professionals to discharge negative

emotions. The between-gender analysis indicated that female construction professionals considered walking and dancing significantly more effective in countering stress than did male professionals. It seems that female professionals have a higher tendency to use low-intensity physical activity to alleviate stress compared to male professionals.

The highest-ranked intellectual counter-measure regarding perceived effectiveness and preference is travel. Iso-Ahola (1983) suggested that travel enables an individual to escape the routine and stressful personal and/or interpersonal environment and gain personal and/or interpersonal intrinsic rewards. This process helps individuals to maintain optimal levels of arousal. Consistent with Iwasaki *et al.*, (2005), this research shows that female professionals have higher preference to engage in arts and cultural activities (i.e. painting and sketching) as a means of coping than do male professionals. Between-professional group analysis revealed that architects reported significantly higher effectiveness for the coping mechanisms of music appreciation, watching TV, and painting and sketching that did other professional groups. One possible explanation is that the creativity involved in these art forms appeals to the embedded creative nature of architects, more than to other construction professionals.

The highest-ranked maladaptive lifestyle counter-measures regarding effectiveness and preference is increased caffeine intake. Low doses of caffeine have been shown to reduce anxiety (Haskell *et al.*, 2005). However, excessive intake can lead to negative effects; symptoms include anxiety, nervousness, restlessness, insomnia, psychomotor agitation, dysphoria, and a rambling flow of thoughts and speech (Gilliland and Andress, 1981). No significant between-gender differences or between-professional group differences were identified in lifestyle counter-measures.

CONCLUSION

This study identified the main physiological, psychological, and sociological workplace strain effects experienced by construction professionals in South Africa as well as the main physical, intellectual, and lifestyle coping mechanisms adopted by construction professionals to mitigate the harmful effects of workplace stress.

The results indicated that physical fatigue, psychological frustration and sociological strain on personal relationships were the most frequently experienced strain effects by construction professionals, reflecting the construction project environment, which is typified by high workload, complexity, adversarial relationships, requiring cooperation between participants, and work-life imbalance. The results highlighted several differences in the experiences of strain effects between male and female construction professionals, which are primarily attributed to the gendered work experiences in the male-dominant construction industry. The between-professional group analysis revealed the higher levels of anxiety experienced by architects compared to other professional groups. More research is warranted to examine the declining mental health of architects.

Non-competitive sporting activities, travel and increased caffeine intake were considered as the most preferred and effective coping measures by professionals. While non-competitive sporting activities provide alternative focus for individuals to deflect thinking about work-related stress, and that travel helps individuals to escape routine, stressful environments to get recharged, the impact of caffeine intake is unclear, as negative effects are associated with excessive caffeine intake. The results showed that female professionals were more likely to adopt low-intensity physical and

arts and cultural activities to counter stress compared to male professionals. The between-professional group differences in counter-measures are minimal although architects were found to have higher preference to art forms of activities.

While there are clear implications for construction professionals to be personally responsible for mitigating the strain effects of their workplace stress; there are also implications for employers and professional and industry associations in the industry. Some reactive measures are already in place, such as stress management seminars and counselling, but a more proactive approach is also needed, whereby industry processes and expectations (such as constant time pressure) are scrutinised with an intent to introduce mitigating change. The construction industry must make "duty of care" an enacted, and not an espoused, value.

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