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## Using a stress audit: the construction site manager experience in the UK

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*Keywords:* Stressors; Construction site managers; Intervention.

The aim of this study was to conduct a stress audit among construction industry site managers in the UK as a precursor to a stress management intervention programme. Qualitative data were obtained from in-depth interviews with a total of 36 male middle and senior construction site managers; and quantitative data were obtained by questionnaire. Based on the analysis of 561 postal questionnaires, eight stressor factors were identified, most significantly, ambiguity (i.e. role and task). Job satisfaction levels were low compared to a normative population and influenced by grade level. Measures of mental health were similar to the norm for males, but both grade of management and type of contract affected mental health. Anxiety levels were significantly high, independent of managerial grade. The stress of work overload and role insecurity (fear of failure) were associated with reduced mental health and high anxiety, and the stress of the organizational culture and climate was the strongest predictor of job dissatisfaction. There was some cause for concern for the vulnerable high-risk groups, i.e. the extreme type A and those working overtime. Medical data from a small subset of managers ( $n = 78$ ) revealed that this group evidenced a better quality of psychological health than the group in total; but a high percentage of personnel had high levels of triglycerides and cholesterol. Recommendations for action focused on the needs of specific subgroups, and guided the organization on the acceptability of possible interventions at individual, interpersonal and organizational levels.

### 1. Introduction

Increasingly, UK companies are providing stress management courses for their employees. Nevertheless, a number of stress researchers have pointed out the weaknesses of this approach, suggesting that stress control can only be truly successful if it is tackled at the level of the individual *and* the organization (Murphy 1984, Murphy and Harrell 1987, De Frank and Cooper 1987, Hart 1987). In order to understand occupational stress and design appropriate stress control programmes, it is therefore necessary to conduct a stress audit which identifies potential stressors and stress outcomes from both the individual and the organizational perspective.

Furthermore, since it is likely that different groups will experience different problems, and research findings are variant, it is important that a stress audit identifies specific problems and high-risk, vulnerable workers. Therefore, based on these premises, the aim of this study was to conduct a comprehensive stress audit among site managers in a large UK construction company, taking both a qualitative and quantitative approach.

To date, besides an exploratory qualitative study carried out by Langford (1988), the authors are not aware of any comparative stress studies among managers in this particular occupation. A survey on health and mobility of construction workers failed to include management, and totally excluded the psychological aspects of health and stress-related illness (Marsh *et al.* 1981). Other reported studies in the construction industry have been

concerned with blue-collar workers and safety issues (Leather 1988, Mattila and Hydodynnmaa 1988). Consequently, no suitable 'industry-relevant' comparisons could be made; thus, where possible, data from studies reporting stress among UK (predominantly white-collar) managers were used as comparisons. Research evidence highlights the stressful nature of the job of manager, and suggests that more stress is experienced from job-related issues than from home or personal circumstances (Cooper *et al.* 1988). Although studies of managerial stress exist, a comprehensive audit was deemed necessary because on-site managers in the construction industry may differ from managers generally, and thus face different problems. For example:

- (1) There is still a tradition of promotion into construction management from a craft background. An individual may start a career as a trade apprentice and can progress up into senior/board-level management (Hillebrandt 1989a). For this reason the workforce tends to be long-serving and stable within a paternalistic organizational framework. Nevertheless, there is evidence to suggest that these patterns are changing. Some of the larger companies have embarked on graduate recruitment programmes to meet the skills supply needs and the demands of technical change. This new policy changes organizational dynamics and raises many issues related to training and development, cultural change, and career progression (especially among the operatives in the industry).
- (2) Construction management has changed because the Industry now tends to rely on a contract-labour workforce. This means that the site manager has ultimate responsibility for the project, but has no direct control over the workforce. The new role is potentially stressful because of the need to successfully liaise between the client, architects, and the operatives, while also satisfying company objectives. A manager might also work for a series of different clients for considerable time periods, and thus risks becoming isolated and remote from the parent company. This has implications for traditional loyalties and company identity.
- (3) Construction site managers appear to work in relatively poor conditions compared to managers generally; that is, using portable offices in a dusty/dirty and noisy environment, and/or outdoors working in all-weather conditions. It is expected that the manager is 'seen' on-site, and so he/she is likely to be physically more active and less remote from the blue-collar workforce than traditional middle and senior managers. Since a sedentary lifestyle may be, in part, causal in some stress-related illnesses (e.g. coronary heart disease, obesity/diabetes, and mental ill-health, i.e. depression and anxiety), the construction site manager may be less vulnerable to these outcomes associated with a high-stress job, but may face different and yet unknown consequences.
- (4) The impending economic links with Europe will increase labour mobility across cultures and communities. The British manager will need to compete and/or co-operative with his/her European counterpart, and learn to interact with a multi-national workforce (Hillebrandt 1989b).

Therefore, we should not assume that previous managerial studies of occupational stress apply to this population.

One major, progressive, construction company in the UK, working at the height of a construction boom, was acutely aware that a highly competitive and changing organizational climate might enhance the occupational stress levels of their site managers. There was also concern about the incidence of stress-related illness among their senior and middle managers. For example, heart disease had forced some early retirement and absence due to long periods

of hospitalization resulting from coronary by-pass surgery. This was costly because the individuals failed to maximize their potential at a time when they should be reaching a career peak, and the organization was losing a wealth of experience and investment in training and development. Additional costs were in terms of manpower shortages and the replacement of personnel. There were also concerns about the links between stress and safety performance. These factors prompted the decision to assess management strengths and weaknesses, and to conduct a stress audit.

The aims of this study were to identify the stressors that may exist among site managers in the construction industry, to examine the psychological and physical health of managers in terms of recognized stressor-outcome or symptoms (mental well-being, job dissatisfaction, physiological measures, sickness absenteeism and health behaviours); to identify possible 'high-risk' groups, e.g. by management grade; to identify the predictors of stressor outcomes; and finally to make recommendations for future action.

Since there is considerable criticism of reliance on self-report behavioural data in this type of study (Fried *et al.* 1984, Steffy and Jones 1988), certain physiological and biochemical variables—collected from a small sample of managers during routine, extensive medical examinations—were incorporated into the study. It is generally assumed that high levels of serum cholesterol, triglycerides, uric acid and blood pressure are objective and reliable correlates of stress (Fried *et al.* 1984) associated with disorders such as coronary heart disease, hypertension and peptic ulcers (Smith *et al.* 1987), although the evidence is not equivocal (Steffy and Jones 1988).

It is also important to consider individual differences in response to stress. Therefore, two potential mediators of individual responses to stress were also measured: a characteristic known as type A behaviour, and the level of perceived social support.

The issue of individual differences and the behaviour pattern identified as 'coronary-prone type A behaviour' (TAB) has received significant attention over the past 30 years, and TAB modification interventions have produced significant results. Originally identified and researched by cardiologists Friedman and Rosenman in the early 1960s, the TAB pattern is characterized by competitiveness, time urgency, aggressiveness, hostility, a need to control the environment, striving for achievement and explosiveness of speech (Friedman and Rosenman 1974). Type B pattern is consistent with the absence of these characteristics. Some studies suggest that certain components of the TAB pattern (particularly anger/hostility) are associated with increased risk of coronary heart disease (CHD); (Dembroski and Costa 1987); and possibly the development of atherosclerosis (Tennant 1987). Type A people exhibit a number of symptoms of risk factors associated with CHD, including raised blood pressure and elevated levels of plasma and low-density lipoprote in cholesterol and triglycerides (Howard *et al.* 1986, Weidner *et al.* 1987).

Research findings also increasingly support the notion that the effects of job stress and strain on health and well-being may be reduced by 'social support'. Evidence exists for both a direct, positive main effect, and for the role of social support as a 'buffer' against strain (Ganster *et al.* 1986, Chisholm *et al.* 1986), depending on the type of support, the source of pressure, and the outcome measured. Supportive relationships with superiors, colleagues and subordinates can reduce levels of perceived job stress; supportive colleagues are less likely to create interpersonal pressures, and an empathetic boss is important in maintaining high levels of self-esteem. Social support from one's supervisor is associated with a variety of affective and somatic outcomes, including job satisfaction, and in a high demand situation, reported psychological strain is lower when social support is strong (Karasek *et al.* 1982).

## 2. Method

### 2.1. Sample

Qualitative and quantitative data were collected. The qualitative approach took the form of 1-hourly in-depth interviews with a random sample of 36 male construction site managers on both large and small work sites (i.e. approximately 5% of the total managerial workforce). All were briefed as to the purpose of the study and were assured confidentiality of individual data (see Sutherland and Davidson 1989). The quantitative data were obtained by formulating a survey questionnaire based on the analysis of the interviews and previous research findings in the field (including standardized and validated psychosocial and medical measures).

All personnel forming the management structure of the company were invited to take part anonymously in the survey. A total of 993 questionnaires were distributed throughout the UK, across 15 grades of management, from 'assistant' to executive director. A return by mail yielded a usable response rate of 56.6% ( $n = 561$ ), of which 94.7% were males. Only 1.1% ( $n = 6$ ) were identified as female; this was approximately the total female managerial population within the company. In other respects the response sample reflected the company profile, in terms of experience, grade and type of work contract. All age groups were represented, from 19 through to 60+ ( $n = 13$ ); 37% were less than 36 years of age; 48% were between 36 and 50; 86% of the respondents were either married or cohabiting; 12% reported 'single' status, and only 2% formed the divorced, separated and widowed group. Certain individuals indicated their status as 'cohabiting' because they were separated or divorced from a partner; thus the divorce/re-marriage rate was approximately 12%. Almost 25% were educated to degree or postgraduate degree standards and a further 26% indicated professional and/or trade qualifications. Less than 5% of the sample held no formal educational qualifications. Within the total sample it was possible to incorporate medical data from individuals undergoing checks during the planning phase of the project. From 118 examinations, 78 individuals (66%) agreed to respond by also providing their medical data, but no data were available to compare responders with non-responders.

### 2.2. Measures

Each questionnaire included items in the following categories: biographical data; sources of stress; type A coronary-prone behaviour scale; social support; mental well-being; job satisfaction; behavioural outcomes (including sickness absence, alcohol, smoking patterns, palliative usage and exercise habits); and physiological and biochemical data.

The survey questionnaire included questions directed at job title, job function, grade of management, monetary value of current project(s), form of building contract, responsibility for the supervision of others, number of hours worked each day, frequency of weekend work, overtime the previous month and basic salary. An item bank of 36 potential sources of stress were rated by respondents on a Likert-type scale (1 = no pressure, 5 = high pressure); with an opportunity to identify stressors as non-applicable. The items were generated from interviews conducted in the qualitative phase of the study. Respondents were also invited to add other pressures to the list.

Type A coronary-prone behaviour was measured employing a 14-item modified version of the Bortner and Rosenman scale (Bortner and Rosenman 1967). This reliable and valid index uses an 11-point rating scale and includes items indicating behaviours identified as 'hard-driving', 'speed', 'impatience' and 'job involvement'. A measure of emotional support was obtained by using the Caplan *et al.* (1975) four-item, four-point rating scale. Subjects are

required to rate the amount of social support that they receive from work and family sources, i.e. the boss, work colleagues, and spouse/partner.

The Crown–Crisp Experiential Index was chosen to measure mental health (Crown and Crisp 1979). It consists of a 48-item questionnaire that provides an approximation of the diagnostic information that would be gained from a formal clinical interview. It is proven to be reliable, valid and objective and provides substantive normative data. A total score is obtained to give a measure of general emotionality/neuroticism, and a profile of six subscales is provided: free-floating anxiety, phobic anxiety, depression, obsessionality, somatic concomitant of anxiety, and an 'H' score now identified as 'sociability and extraversion'.

Levels of job satisfaction were measured using the Warr *et al.* (1979) Job Satisfaction Scale. This 15-item, seven-point response measure, with 1 indicating the most negative response (i.e. extremely dissatisfied), and 7 indicating extremely satisfied, gives a global measure of job satisfaction and three subscales, identifying levels of intrinsic, extrinsic and employee relations satisfaction.

Items measuring levels of alcohol consumption, tobacco smoking and use of palliatives were included. In addition, exercise activity and sickness absence details were also included.

Fourteen per cent of the total sample of managers participated in a medical examination including kidney, liver and cardiovascular reflexes. Various blood and urine samples were also taken from each subject after 12–14 hour fasting, and analysed according to standard laboratory procedures. Therefore, haemoglobin, fasting glucose, urea, uric acid, liver function (GGTP), cholesterol (HLD), triglycerides, free  $T_4$  (thyroxin) and urine were measured for each subject. All participants were weighed and their height measured, were given an ECG and X-ray, and their systolic and diastolic blood pressure (lying down) was recorded.

### 3. Results

#### 3.1. Manifestations of stress

Job dissatisfaction, poor mental health, maladaptive coping behaviours such as cigarette smoking, alcohol consumption, absenteeism and certain physiological and biochemical measures may be the manifestations of response to stress and pressure. By making comparisons with normative populations and/or equivalent occupational groups it is possible to make some assessment about the general and psychological well-being of managers in the construction industry.

#### 3.2. Job satisfaction (polarity: high score = high satisfaction)

Normative data for managerial grade employees are scarce. However, levels of reported job satisfaction were significantly lower for managers working in the construction industry (CIMs) compared with previous findings among managers and supervisory grades employed in engineering. For example, Clegg and Wall (1981) reported managerial and supervisory mean scores at 79.2 (SD 10.79 and 77.6, SD 8.5 respectively), compared to only 72.3 (SD 12.18) for the CIMs ( $t = -4.89$ ,  $df 616$ ,  $p < 0.002$ , two-tailed). When the components of the job satisfaction scale were examined (intrinsic, extrinsic, and employee relations job satisfaction) it was observed that CIMs expressed the least satisfaction with employee relations issues (i.e. the recognition for good work, industrial relations in the company, attention paid to suggestions made, the way the firm is managed, chances of promotion, and rate of pay). Also, job satisfaction was positively related to managerial grade level, i.e. the senior grades were

Table 1. Crown-Crisp (1974) mean subscale scores as a function of form of contract.

Variable	Construction management	Management contracting	'Others'	F	p
Anxiety	4.1	3.3	3.3	4.10	0.01
Obsessionality	6.5	5.7	5.9	3.30	0.05
Depression	3.5	2.8	3.0	3.10	0.05
Phobic anxiety	3.1	2.6	2.6	3.60	0.05

more job satisfied than the lower and middle grades (mean scores 78, 70 and 71 respectively,  $F = 17.7$ ,  $df\ 2$ ,  $p < 0.001$ ).

### 3.3. Mental health (polarity: high score = poor mental health)

The overall mental health score (Crown and Crisp 1979) for CIMs did not vary significantly from the male population normative score (Crisp 1977) (mean scores 23.2 versus 22.8). The lower managerial grade personnel in the company exhibited the poorest levels of mental health (mean scores of 25, 23.8 and 21.2 for lower, middle and senior grades respectively,  $F = 3.74$ ,  $df\ 2$ ,  $p < 0.01$ ). Form of work contract (i.e. working on 'construction management' or 'management contracting') also appeared to be a mediating factor in mental health; the construction management group had significantly poorer levels of well-being compared to the management contracting respondents and those on working on 'other' forms of contract (mean scores 25.7, 21.9 and 22.6 respectively,  $F = 6.09$ ,  $df\ 2$ ,  $p < 0.01$ ).

Analyses of the Crown-Crisp Experiential Index subscale scores indicated that CIMs were significantly more anxious (free-floating anxiety) than males in the general population (Crisp 1977): mean scores 3.55, SD 2.95 and 2.8, SD 2.8 respectively ( $t = 3.75$ ,  $df\ 876$ ,  $p < 0.01$ , two-tailed); but the concomitant of somatic anxiety (i.e. associated with general aches, headaches, pains, tiredness and sleep disturbance) were significantly lower among this group ( $t = -5.58$ ,  $df\ 864$ ,  $p < 0.002$ , two-tailed). Also, an unacceptably high percentage of respondents had extremely high obsessionality scores; 12.5% had a score of 9 or more (i.e. higher than psychoneurotic outpatients), whereas the mean score was 6.0 (norm = 6.8). Reported levels of depression were similar to the norm, but the middle-grade managers were significantly more depressed than both the lower and senior grades (mean scores 3.3, 2.8 and 2.6 respectively,  $F = 4.0$ ,  $df\ 2$ ,  $p < 0.01$ ). Senior construction site managers also tended to report lower levels of phobic anxiety than the other grades ( $F = 4.7$ ,  $df\ 2$ ,  $p < 0.01$ ).

Table 1 shows that CIMs working on 'construction management' projects were significantly more anxious, obsessional and depressed than those working any other type of contract; they also reported more levels of phobic anxiety.

### 3.4. Health behaviours

Twenty-six per cent of the sample ( $n = 146$ ) were smokers of tobacco (one-third of these smoked a pipe or cigars). This was comparable with statistics for managerial occupational groups (Cooper *et al.* 1988). Reported alcohol consumption levels were very low; 92% of respondents claimed to consume 14 units of alcohol, or less per week (the current recommended 'safe' maximum units for males per week is 21). Use of palliatives was minimal; 21% never or rarely engaged in any form of exercise.

### 3.5. Absenteeism

Forty-six per cent of respondents indicated absence due to illness in the past year. Of these, 43% were absent on two occasions; 17% were absent on three occasions. Over a 1-year period a total of 1702 days were lost (ranging from 1 to 90 days; average 6.7 days; median 3 days; 11% absent for 14 days or more). Sickness absenteeism data from managerial groups are scarce and so comparisons are difficult. Nevertheless, these figures were better than for managers working in a major retail organization in the UK, reporting a 59% level of sickness absence (Taylor 1992).

### 3.6. Medicals

Seventy-eight middle and senior managers taking part in routine medical examinations agreed to supply their medical information together with the questionnaire data; 32% of this subgroup had abnormally high levels of serum cholesterol; 33% had high triglyceride levels. Although the evidence is equivocal, Hendrix *et al.* (1985) state that elevated triglyceride levels are a correlate of actual stress and a good indicator of coronary disease risk. Serum cholesterol levels can be used as an indicator of atherosclerosis and coronary artery disease, but also as an indicator of liver function since serum cholesterol is synthesized by the liver. Analysis by grade level of management indicated differences between middle and senior managers on only two of the measures: on average the middle-grade managers had higher levels of triglycerides (scores 2.1 and 1.4,  $t = 1.99$ ,  $df 77$ ,  $p < 0.05$ ), and GGTP (a liver function test, also used for assessing alcoholism) (scores 39.6 and 29.1 respectively,  $t = 2.04$ ,  $df 77$ ,  $p < 0.05$ ). The average GGTP score for the total group was 33.4 mmol/l, range 5–103; 8% had a score in excess of 65 mmol/l. No differences were observed as a function of type of work contract. However, the managers taking part in routine medical examinations exhibited a significantly better level of mental health than CIMs generally (mean scores 20.8 and 23.5 respectively;  $t = -2.11$ ,  $df 435$ ,  $p < 0.05$ , two-tailed), and lower levels of anxiety (scores 2.8 and 3.7;  $t = -2.6$ ,  $df 121.5$ ,  $p < 0.01$ , two-tailed).

### 3.7. Social support

The total social support measure for CIMs was the same as for British managers generally (Glowinkowski 1985): mean scores 24.9 and 24.6 respectively. However, there were some differences when the various sources of social support were examined separately. CIMs tended to report significantly more support from the boss than British managers generally (mean scores 7.87, SD 2.73 and 7.12, SD 2.9 respectively,  $t = 3.49$ ,  $df 74$ ,  $p < 0.001$ ), but less support from their work colleagues (mean scores 6.86, SD 2.34 and 7.27, SD 2.3,  $t = -2.26$ ,  $df 728$ ,  $p < 0.05$ ). Lower-grade level CIMs tended to report higher levels of social support than middle or senior managers (mean scores 29.3, 27 and 27.4 respectively,  $F = 3.77$ ,  $df 2$ ,  $p < 0.01$ ); particularly, higher levels of social support from their spouse/partners than the other groups (mean scores 13.7, 11.4 and 11.4 respectively,  $F = 9.57$ ,  $df 2$ ,  $p < 0.001$ ).

### 3.8. Type A coronary-prone behaviour

To compare the distribution of the type A behaviour pattern among CIMs with British industry managers, individuals were classified into four groups: A1 (extreme type A), A2, B3 and B4 (extreme type B). Table 2 shows the percentage of managers in each category: no significant difference was observed.

To investigate differences between type A and type B respondents, a tertiary split categorization was used, as suggested by Ivancevich *et al.* (1982). That is, to identify extreme



Table 2. Distribution of type A/type B pattern among construction managers compared to British industry managers (percentages).

Type	Construction industry managers ( <i>n</i> = 519)	British managers ( <i>n</i> = 251) <sup>d</sup>
A1—score >111	21.4	17.9
A2—score 98–111	35.2	34.6
B3—score 70–97	42.4	44.7
B4—score < 70	1.0	2.8
Mean Score	100.5	98.5

<sup>†</sup>Source: Glowinkowski 1985.

(or true) A-types and true B-types from the population with scores in the mid-range of the continuum (i.e. the intermediate, A/B-types). Table 3 shows the results of a series of three-way analysis of variance used to examine the TAB. The table shows that CIM type A exhibited significantly poorer levels of mental health, more anxiety, and higher levels of obsessiveness than type B or A/B intermediates. However, type As reported significantly higher levels of intrinsic job satisfaction (i.e. freedom to choose own method of working, amount of responsibility given, opportunities to use abilities, and variety). All of these job factors are important to A-types. Indeed, Table 3 also shows some insight into the workaholic tendencies of these individuals, who also reported working more hours each day, more overtime working, and have (or assumed) more responsibility in terms of the numbers of people supervised, than managers in the other groups.

Type A behaviour did not vary as a function of age; however, it was strongly and positively associated with managerial grade level; thus senior managers had the highest mean TAB scores (i.e. 95.9, 99.3 and 104.8 respectively for lower, middle and senior grades;  $F = 12.6, p < 0.001$ ). This might be a function of formal or informal selection and promotion policies in the company. The type A workaholic pattern of behaviour may be thus elicited and rewarded in this macho environment. The negative implications of this are explored further in the investigation of predictors of stress outcomes.

Table 3. Type A : Type B behaviour patterns: differences in stressor outcomes and work related variables (mean scores).

Variable	Type A	Type A/B	Type B	<i>F</i>	<i>p</i>
Job satisfaction	73.1	72.70	70.80		n.s.
Intrinsic job satisfaction	20.7	20.3	19.1	4.81	0.01
Mental health	26.2	22.7	21.1	9.60	0.001
Anxiety	4.22	3.32	3.27	5.34	0.01
Obsessiveness	6.82	5.75	5.44	9.97	0.001
Phobic anxiety	2.90	2.80	2.62		n.s.
Somatic anxiety	3.48	3.32	2.87		n.s.
Depression	3.32	3.14	2.67		n.s.
Number of hours worked/day	10.8	10.4	10.1	10.71	0.001
Hours overtime in previous month	41.3	33.1	30.1	5.25	0.01
Number of people supervised	16.1	10.2	5.2	6.00	0.01

n.s. = Not significant.

Table 4. Top ten stressors among construction industry managers.

	Mean score <sup>†</sup>	SD
1 Time pressures	3.46	1.12
2 Working long hours	3.27	1.15
3 Insufficient time to pursue leisure interests	3.26	1.22
4 Volume of paperwork	3.25	1.21
5 Insufficient time spent with family/home	3.16	1.26
6 Travel to and from the job	2.96	1.37
7 Lack of support from architects	2.96	1.23
8 Inadequacy of communication flow	2.91	1.00
9 Staff shortages	2.85	1.21
10 Responsibility for situations not fully in my control	2.80	1.20

<sup>†</sup>Based on a scale of 1 to 5; 1 = no pressure, 5 = high pressure.

### 3.9. Sources of stress

To quantify sources of pressure, CIMs were asked to rate 36 potential sources of stress on a five-point scale: 1 = no stress, 5 = high stress or pressure. Table 4 shows the top ten rated stressors; 'time pressures' was the most significant source of stress. Working long hours, work-related travel, staff shortages, paperwork, poor communications and perceived lack of control were also significant issues, with some spill-over of time pressures into family and leisure activities. 'Over promotion' and 'no sense of belonging to the company' were rated the lowest sources of pressure (mean scores of 1.33 and 1.56 respectively). A factor analysis of all 36 items was carried out as a preliminary step to regression analysis. Principal component, varimax rotation was used to extract eight stressor factors which accounted for 55.9% of the variance. A Scree Test was used to identify the optimum number of factors and Kaiser's criterion was applied (Child 1976).

Table 5 shows the intercorrelations between the factor analysed stressor factors, individual mediators and stress outcome variables (job dissatisfaction and poor mental well-being). The stress of ambiguity at work and from being in the organization itself was significantly associated with reported job dissatisfaction, and moderate relationships were observed between levels of stress and mental health. Moreover, role insecurity was associated with reported levels of anxiety. Moderate associations were also observed between type A behaviour and the stress of work overload, but only weak associations between reported levels of stress and total social support were noted.

### 3.10. Predictors of outcome variables

By far the most important part of this survey was to identify the variables associated with negative affect. Therefore, stepwise multiple regression analysis was used as a means of identifying the independent variables which predicted outcomes including job dissatisfaction and mental ill-health. The measures included (1) the stressors factors; (2) career and biographical variables; (3) potential stressor mediators, i.e. type A behaviour, social support. Subject/variable ratio was maintained at a minimum of 20:1.

### 3.11. Predictors of job satisfaction

Table 6 shows the results of the regression analyses, and indicates multiple  $R$ ,  $R^2$ ,  $R^2$  change, and simple  $R$  to show the direction of the relationships. Predictors are included if they contribute to at least 1% of the variance and if the contribution is significant at the 0.05 level.

Table 5. Intercorrelations among survey variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Sources of stress</i>																	
Factor 1: Ambiguity	—																
F2: Overload	30	—															
F3: Manpower problems	42	45	—														
F4: Culture and problems	58	26	36	—													
F5: Homework interface	24	38	34	30	—												
F6: Role insecurity	37	35	28	29	19	—											
F7: Boundary relationship	28	45	33	26	32	25	—										
F8: New technology	28	19	18	31	03 <sup>n.s.</sup>	26	18**	—									
<i>Mediators</i>																	
9 Type A	04 <sup>n.s.</sup>	21	16	08 <sup>n.s.</sup>	09*	10*	08 <sup>n.s.</sup>	01 <sup>n.s.</sup>	—								
10 Social Support	19	08*	15	15	14	01 <sup>n.s.</sup>	04 <sup>n.s.</sup>	02 <sup>n.s.</sup>	08*	—							
<i>Outcomes</i>																	
11 Job satisfaction	46	10**	25	51	25	04 <sup>n.s.</sup>	04 <sup>n.s.</sup>	08 <sup>n.s.</sup>	05 <sup>n.s.</sup>	36	—						
12 Anxiety	26	29	19	18	23	39	16	08 <sup>n.s.</sup>	14	14	17	—					
13 Depression	25	24	17	28	30	24	20	08 <sup>n.s.</sup>	11	16	22	57	—				
14 Phobic anxiety	13**	17	10*	13**	13**	12**	10*	11*	08*	08*	10*	39	29	—			
15 Obsessionality	16	24	19	07 <sup>n.s.</sup>	14	25	17	10	23	04 <sup>n.s.</sup>	10*	45	38	22	—		
16 Somatic anxiety	21	22	17	17	23	14**	12*	07 <sup>n.s.</sup>	12**	21	18	50	48	27	24	—	
17 Mental health	25	31	22	22	27	29	15**	15**	21	15	18	81	73	55	63	64	—

Unmarked  $p < 0.001$ ; \*\* $p < 0.01$ ; \* $p < 0.05$ ; <sup>n.s.</sup> not significant

Table 6. Predictors of job satisfaction.

Step	Stressor variable	Multiple <i>R</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	Simple <i>R</i>
1	Scale 4—Stress: culture and climate	0.51	0.26	0.26	-0.51
2	Social support from the boss	0.66	0.43	0.17	0.49
3	Scale 6—Stress: role insecurity	0.68	0.46	0.03	0.05
4	Scale 1—Stress: ambiguity	0.71	0.50	0.04	-0.46
5	Social support from colleagues	0.72	0.52	0.02	0.37
6	Scale 5—Stress: home-work interface	0.73	0.53	0.01	-0.24

$F = 6.23; p < 0.01$ .

Six independent variables explained 53% of the variance on total job satisfaction. The strongest predictors of job dissatisfaction were the stressors associated with 'being' in the organization (factor 4) and lack of social support from the boss. The stress of 'ambiguity' at work, and the home-work interface, and lack of support from work colleagues were also minor contributors to job dissatisfaction. However, the 'role insecurity' stressor factor appeared to operate as a minor but positive source of stress. However, this also featured as a predictor of poor mental health, (particularly levels of anxiety).

### 3.12. Predictors of mental health

Table 7 illustrates that poor mental health was predicted by the stress of work overload, role insecurity, and low levels of extrinsic job satisfaction (i.e. associated with physical working conditions, fellow-workers, one's immediate boss, the hours of work, and job security): high TAB scores and tobacco smoking were also associated with reduced levels of mental well-being. (Note that type As were also more likely to be tobacco smokers than type Bs.) In total these variables explained 20% of the variance.

### 3.13. Overtime working as a mediator of response to stress

Since time pressures, long hours of working, and lack of time for family and leisure pursuits were identified as significant sources of pressure for CIMs, the decision was made to investigate this issue further. For example, CIMs reported working an average of 10.3 hours per day, SD 1.3 (range 6–15 hours); thus almost 40% of respondents were working a day of more than 11 hours; additionally, only 20% of CIMs reported that they never worked at weekends. Table 8 shows the negative impact of this practice among CIMs: individuals who reported working in excess of 20 hours overtime in the month previous to completing the questionnaire were compared with those who had worked less than 21 hours overtime reported. Individuals who had worked longer hours were significantly worse off in terms of psychological health and job satisfaction and were more likely to report higher levels of strain and pressure at work.

Table 7. Predictors of mental health.

Step	Stressor variable	Multiple <i>R</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	Simple <i>R</i>
1	Scale 2—Stress: workload	0.30	0.09	0.09	0.30
2	Scale 6—Stress: role insecurity	0.36	0.13	0.04	0.29
3	Extrinsic job satisfaction	0.41	0.16	0.03	-0.23
4	Smoking	0.43	0.19	0.02	0.17
5	Type A behaviour	0.45	0.20	0.02	0.21

$F = 4.10; p < 0.05$ .

Table 8. Differences between CIMs in terms of overtime working (hours worked) (mean scores).

	20 hours + overtime	20 hours or less overtime	<i>t</i>	<i>p</i>
<i>Outcome variable</i>				
Mental health	23.9	22.1	1.97	0.05
Job satisfaction	71.5	73.2	-1.61	0.05
Extrinsic job satisfaction	23.8	25.0	-3.70	0.001
Anxiety	3.61	2.95	n.s.	
Phobic anxiety	2.77	2.72	n.s.	
Obsessionality	6.10	5.73	n.s.	
Somatic anxiety	3.36	2.99	1.72	0.05
Depression	3.31	2.76	2.41	0.01
<i>Sources of stress</i>				
Ambiguity	14.60	13.89	1.76	0.05
Work overload	17.99	15.91	5.21	0.001
Manpower problems	12.88	10.25	6.89	0.001
Climate and culture	8.90	8.35	n.s.	
Home-work interface	12.28	10.55	4.98	0.001
Role insecurity	4.88	4.59	n.s.	
Boundary relationships	7.24	5.64	5.67	0.001
New technology/computers	2.89	3.03	n.s.	

† One-tailed tests; df approximately 540.

‡ Hours reported in the month previous to questionnaire completion.

n.s. = Not significant.

### 3.14. *The relationship between stress and physiological/biochemical variables*

Correlational analysis was conducted to evaluate the relationships among independent and dependent variables. There were only a few, very moderate associations between reported stress and physiological outcomes. The stress of work overload ( $p < 0.05$ ), manpower problems ( $p < 0.05$ ), and the home-work interface ( $p < 0.01$ ) were positively associated with triglyceride levels. In addition, the stress of manpower problems, 'being in the organization' (i.e. culture and climate), and the home-work interface were positively related to levels of uric acid ( $p < 0.01$ ). This reflects the activity level of the sympathetic nervous system, which in turn indicates the level of stress in individual physiology. Systolic blood pressure was positively related to the stress associated with manpower problems, e.g. staff shortages ( $p < 0.05$ ). Paradoxically, both diastolic blood pressure and serum cholesterol levels were inversely related to the stress of the organizational culture and climate ( $p < 0.05$ ). Thus the links between reported stress and physiological outcomes are weak and tenuous, although the small sample size and the limitations of single measures may have reduced statistical power.

## 4. Discussion

The results of this survey indicated that stress and pressures were experienced by construction site managers stemming from ambiguity at work, work overload conditions, manpower problems in the form of staff shortages, the actual strains of the culture and climate of the organization, insecurity in the role of manager, the issues of working within 'boundary relationships' and new technology, and finally the time-pressure overspill situation into the home and leisure environment. It appeared that such circumstances might manifest psychologically in the form of job dissatisfaction and poor mental health. Physiological responses might include elevated levels of triglyceride, uric acid, or systolic blood pressure; and behavioural/coping responses to stress typically might take the form of job absenteeism, and tobacco smoking.

It was also observed that certain mediators of stress were in evidence. Type A individuals appeared to be more at risk than their type B counterparts. Also, social support from both the immediate boss and work colleagues was likely to have impact on outcomes such as job dissatisfaction and poor mental health, although the relationships between lack of social support and perceived stress levels were only weak.

Nevertheless, these findings suggested that change should not be implemented as a general strategy, but carefully targeted because the problems tended to be specific to certain grades of management, to various forms of work contract, and/or age group. In terms of outcomes, one of the main issues seemed to be the high levels of anxiety, independent of grade level. This was predicted by the stress of role insecurity (fear of failure, mistakes, over-promotion etc), work overload, and dissatisfaction with extrinsic job factors (i.e. hours of work, job security, physical work conditions, fellow-workers and the immediate boss). Overall, the issue of job dissatisfaction was limited to the middle and lower grades of management, especially on employee relations issues. Levels of mental health were a cause for concern within certain managerial grades, and for those working specific types of contract.

It was clear that stress was not all-pervasive among construction industry managers and so it was suggested that specific issues should be targeted using an integrated approach to stress management. This was advocated because it seeks to address the problems at three levels, including the system/structural level (organization), the work group unit level (the team) and the individual level. For example, change at the system/structural level operates by seeking to eliminate or minimize a source of stress, which might include an examination of the long hours of working in the company, which was clearly having an adverse impact and needed to be changed; or the stress of role ambiguity, common in fast-growth industries, which might be minimized by paying more attention to personnel appraisal practices. At the level of the team, interpersonal strategies such as team building and communication skills training can help to alleviate or eliminate stress. Indeed, the role of social support as a predictor of psychological state emphasized the need to offer individual strategies for coping with stress. This means 'awareness raising' to improve personal fitness to cope with stress. The aim is to make employees aware of the links between stress, illness and personal behaviour. Focused programmes also aim to identify individual health and the stress profiles of individuals and highlight problem areas and skill deficits (e.g. time management and assertiveness). Ultimately, a stress-audit approach to stress control can help by targeting scarce resources, identifying appropriate interventions which are acceptable to the workforce and the need for changes in the organization to eliminate or minimize stress in the workplace.

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