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Stressful jobs and non-stressful jobs: a cluster analysis of office jobs

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The purpose of the study was to determine if office jobs could be characterized by a small number of combinations of stressors that could be related to job-title information and self-report of psychological strain. Two-hundred-and-sixty-two office workers from three public service organizations provided data on nine job stressors and seven indicators of psychological strain. Using cluster analysis on the nine stressors, office jobs were classified into three clusters. The first cluster included jobs with high skill utilization, task clarity, job control and social support and low future ambiguity, but also high on job demands such as quantitative work-load, attention and work pressure. The second cluster included jobs with high demands and future ambiguity and low skill utilization, task clarity, job control and social support. The third cluster was intermediary between the first two clusters. The three clusters were related to job-title information. The second cluster was the highest on a range of psychological strain indicators, while the other two clusters were high on certain strain indicators but low on others. The study showed that office jobs could be characterized by a small number of combinations of stressors that were related to job-title information and psychological strain.

1. Introduction

A number of job stress models have been proposed; some focused on select job stressors such as work-load and decision latitude (Karasek 1979), while others give lists of stressors or propose taxonomies of stressors. Cooper and Marshall (1976) proposed that workplaces can be characterized by five categories of job stressor: (1) factors intrinsic to the job, (2) role, (3) career development, (4) relationships at work, and (5) organizational structure and climate. Other exhaustive lists of stressors and taxonomies of stressors have been proposed (Beehr and Newman 1978, Schuler 1980, Holt 1982). Workplaces are often characterized by more than one job stressor, thus making it difficult to focus on a small number of job stressors. Therefore, job stress models which focus on a few stressors might limit our understanding of the workplace characteristics that contribute to worker strain. This study tests the idea that jobs can be characterized by a small number of combinations of job stressors.

Smith and Sainfort (1989) have described a model of job stress that predicts that a lack of 'balance' in various elements of the work system leads to stress reactions. Elements of the work system include: (1) task factors (repetitiveness and job control), (2) work organization factors (social support and career/future concerns), (3) technology characteristics (tool and workstation design), (4) environmental factors (noise and lighting), and (5) individual characteristics (physiological and psychological needs). The model states that working conditions as defined by the five-element work system produce a 'stress load' on the individual. The objective is to reduce worker stress and adverse health consequences by 'balancing' the various elements of the work system. Positive elements of the system are postulated to

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compensate for negative elements of the system to reduce the stress load. For instance, the adverse effects of low job content can be balanced by an organizational supervisory structure that promotes worker control over tasks. Thus, there may be combinations of job conditions that lead to a 'balanced' state of the work system, that is the total 'stress load' is reduced. The aim of the present study was to determine empirically if jobs held by a sample of office workers can be characterized by a small number of job conditions. The study focused on select task and organizational factors of the total work system.

The following job stressors were examined in this study: (1) quantitative work-load, (2) attention, (3) work pressure, (4) utilization of skills, (5) task clarity, (6) job control, (7) social support from supervisor, (8) social support from colleagues, and (9) job future ambiguity. They were chosen because it was felt that they were specific enough to discriminate between various types of office jobs. These nine job stressors also represent a good variety of job conditions. Following the Cooper and Marshall (1976) model, they fall into three categories: factors intrinsic to the job (quantitative work-load, attention, work pressure, utilization of skills, task clarity and job control), career development (job-future ambiguity) and relationships at work (supervisor support and colleague support). According to the Smith and Sainfort (1989) model of the work system, they fall into the task (quantitative work-load, attention, work pressure, utilization of skills, task clarity and job control) and the work organization (social support from supervisor and colleagues and job-future ambiguity) categories.

The nine job stressors chosen to be examined in this study are important stressors to consider in office workers. Demands (quantitative work-load, attention and work pressure) and job control are the two factors in Karasek (1979) Job Strain model. Demands, job control and social support are the three elements in the Payne (1979) and Johnson (1989) models. In a study of 23 occupations (Caplan *et al.* 1975), utilization of skills, participation (or job control), job-future ambiguity and social support were associated with job dissatisfaction, while social support also influenced depression. In a study of visual display terminal (VDT) operators (Smith *et al.* 1981), the following job stressors differentiated clerical VDT users from professional VDT users: staff support, autonomy, work pressure, supervisory control and job-future ambiguity. Clerical VDT users also reported more work-load dissatisfaction and boredom than did professional VDT users. In a study of women office workers, Piotrkowki *et al.* (1987) found that lack of control, work-load and interpersonal tensions were the main determinants of various health and well-being indicators. The job stressors selected for this study represent a range of working conditions, are relevant for office workers, and are specific enough that they can discriminate between a range of office jobs.

The purpose of this study was to determine if jobs can be characterized by a small number of combinations of stressors that can be related to job-title information and psychological strain. Workplaces can be characterized by many stressors (see Cooper and Marshall 1976), and often have more than one stressor. Frese and Zapf (1988) argued that 'the more stressors there are already, the more there are added' (p. 394). They cited a cluster-analytic German study by Dunckel (1985) that found that workplaces are either uniformly high or low on various stressors. In a large-scale study of 23 heterogeneous jobs, Caplan *et al.* (1975) found that low utilization of abilities, low participation and low job complexity were stressors which tended to be found in the same jobs. University professors and physicians all reported low levels of these stressors, while machine-paced and other assembly workers, fork-lift drivers

and machine tenders all reported high levels of these stressors. However, this study did not include a range of office jobs. With the growing number of office workers, it seems important to study combinations of stressors in office environments and their relationships to strain.

The underlying rationale of this study is that combinations of stressors might be more important than are lists of single stressors in understanding how jobs are designed and how people react to their jobs (stress reactions). The cluster-analytic study by Dunckel (1985) showed that jobs can be either uniformly high or low on various stressors. This finding suggests the need to look at how stressors can be combined in various jobs. The results of the Dunckel study need to be replicated. Our study examined how a sample of office jobs can be characterized by a few combinations of stressors. Results were validated by examining how the combinations of stressors compared to existing job titles. We expected that the combinations of stressors would be related to certain job titles. For instance, low-level jobs, such as data-entry operators, might be characterized by many stressors, such as low job control and high work pressure. We also examined the relation between the combinations of stressors and psychological strain. Since the link between stressors and strain is complex (Smith 1987), we did not expect to find very high correlations between combinations of stressors and psychological strain. However, it is important to examine the link between combinations of stressors and worker reactions in order to find solutions for reducing psychological strain.

2. Method

2.1. *Sample*

Two-hundred-and-sixty-two office workers from three public service organizations in the Midwest participated in the study.

The project was presented to and accepted by management and union at all study sites. Contact persons in each department were asked to inform potential participants. All office workers were asked to participate in the study. Eighty-nine percent of those contacted participated in the study. Questionnaires were distributed either by the contact persons or directly by researchers. The majority of the participants were full-time permanent employees. Sixteen percent were either part-time or non-permanent staff. Seventy-three percent were female. Only 12 participants were non-white. Half of the participants were married, while 29% were single and the rest separated, divorced or widowed. The average age was 38·7 years (standard deviation (SD)=10·3 years). On average, participants had 8·9 years of tenure with their company (SD=6·7 years) and 5·1 years of experience with current position (SD=5·0 years). The average number of years of schooling was 14·4 (SD=2·2 years).

2.2. *Measures*

The unit of analysis was the job. We assumed that one and only one person could be attached to one and only one job, and that the job holder was a good source of information about job stressors. Based on the 'known group technique', we used job-title information to assess the concurrent validity of the job stressor measures (Bohrnstedt 1983). If the job-stressor measures vary across job categories as they are supposed to, then the job stressor measures have relatively good concurrent validity.

A survey questionnaire was developed using questions from various surveys used in previous research studies. The Caplan *et al.* (1975) questionnaire was used to measure two stressors, quantitative work-load (11 items) and utilization of skills (three items), and two indicators of strain, boredom (three items) and work-load dissatisfaction (three items).

Twenty-eight items from Smith *et al.* (1981) and Piotrkowki *et al.* (1987) were chosen that *a priori* represented facets of the job stressors of interest. All survey items were factor analysed, using principal components analysis with Varimax rotation. The seven-factor solution explained 64% of the variance and was selected based on the ease of interpretation of the factors, on the lack of overlap between factors and on high communalities. Items were summed to form the following seven variables: (1) work pressure (six items), (2) attention (four items), (3) task clarity (two items), (4) job control (five items), (5) supervisor support (five items), (6) colleague support (two items), and (7) job-future ambiguity (four items). A list of questionnaire items included in the factor analysis is given in the Appendix.

Four scales of the Profile of Mood States (POMS) (McNair *et al.* 1971) were selected as indicators of psychological strain: tension–anxiety, depression, anger and fatigue. The last index of psychological strain was the Daily Life Stress scale (Reeder *et al.* 1973).

Means, standard deviations and reliability scores of the study variables are given in table 1. All variables, except the four POMS scales, were normally distributed. The four POMS scales had a majority of people at the low end of the response scale. Square-root transformations of these variables were performed and yielded results similar to the results with the non-transformed variables. Therefore, we have decided to use the non-transformed data.

Table 1. Means, standard deviations (SD), number of items and reliability scores of the study variables.

	Mean*	SD	No. of items	Reliability†
Independent variables				
Quantitative work-load	2·9	0·4	11	0·84
Attention	3·1	0·5	4	0·70
Work pressure	2·6	0·7	6	0·82
Utilization of skills	2·7	0·6	3	0·70
Task clarity	3·3	0·6	2	0·64
Job control	2·4	0·6	5	0·73
Supervisor support	3·0	0·8	5	0·90
Colleague support	3·2	0·6	2	0·75
Job-future ambiguity	1·7	0·7	4	0·79
Dependent variables				
Boredom	2·1	0·6	3	0·88
Work-load dissatisfaction	1·9	0·6	3	0·84
Tension–anxiety	9·7	5·8	9	0·87
Depression	8·7	8·5	15	0·92
Anger	9·3	8·3	12	0·92
Fatigue	8·8	6·4	7	0·91
Daily life stress	2·1	0·6	4	0·82

*All scales, except the four POMS scales (tension–anxiety, depression, anger and fatigue), vary from 1 to 4. The tension–anxiety scale varies from 0 to 29, the depression scale from 0 to 43, the anger scale from 0 to 47 and the fatigue scale from 0 to 27.
†Reliability scores are Cronbach's α coefficients.

2.3. *Statistical analysis*

The main purpose of this study was to determine if jobs could be characterized by a small number of combinations of stressors. Cluster analysis was used to produce empirical clusters of jobs classified on the basis of their scores on the nine stressors. This method has been successfully used by Payne and Fletcher (1983) to categorize school teachers based on their scores on demand dimensions (disciplinary demands, maintaining standards and work-load demands), interpersonal support and job discretion; and by Dunckel (1985) to show that jobs are either uniformly high on various stressors or uniformly low.

A non-hierarchical clustering procedure (k-means procedure) as opposed to a hierarchical procedure was used to classify jobs because it can handle larger data sets, it makes more than one pass through the data and thus compensates for poor initial partition of the data, and it produces clusters that are not nested and therefore are not part of a hierarchy (Aldenderfer and Blashfield 1984). Since our objective was to determine combinations of stressors that characterize homogeneous groups of jobs and the k-means procedure tends to minimize the variance within clusters, this method is appropriate.

The $k=2$, 3, 4, 5, 6 and 7 clusters solutions were compared. The decision about the number of clusters was based on the following validity criteria.

(1) Replication (Everitt 1977, Aldenderfer and Blashfield 1984). The sample was randomly split into two samples. Cluster solutions were compared between the two samples.
(2) Predictive power (Everitt 1977, Aldenderfer and Blashfield 1984). The clusters are useful if they can predict strains. Multivariate analysis of variance was conducted to examine differences across the clusters with regard to the psychological strain indicators.
(3) Interpretation (Everitt 1977). The clusters should be easy to interpret.
(4) Jump in within-cluster variance to between-cluster variance ratio (Johnson and Wichern 1982). Wilk's λ values were compared across cluster solutions. Wilk's λ is the ratio of generalized variances, that is the ratio of the determinant of the residual covariance matrix by the determinant of the sum of the treatment and the residual matrices (Johnson and Wichern 1982). A 'jump' in the Wilk's λ value indicates a gain of information. This criterion is similar to the visual examination of the scree graph in factor analysis. Statistical tests have been developed to test for significant 'jump' (see, for example, Beale (1969). However, there is no agreement among statisticians as to the goodness of these tests (Everitt 1977, Aldenderfer and Blashfield 1984). Thus, evaluation of the 'jump' was made subjectively.

Criteria (1) and (2) are among the better ways of validating a cluster solution (Everitt 1977, Aldenderfer and Blashfield 1984). The cluster solution should also be as parsimonious as possible.

The technique of comparing the clusters on external variables not used to generate the cluster solution is another good way to validate a cluster solution (Aldenderfer and Blashfield 1984). Thus, we decided to use job-title information for validating the cluster analysis solution. Based on the job-title information, jobs were classified into seven job categories (see table 2). A χ^2 test was performed to examine the relationship between clusters and job categories.

Table 2. Job categories.

Category 1	Computer user ($N=25$): data-entry operator, word processing operator
Category 2	Clerk typist ($N=44$)
Category 3	General office ($N=39$): secretary, administrative clerk, legal secretary
Category 4	Specialized clerk ($N=43$): parts clerk, operation clerk, revenue clerk, data control clerk, library page, library assistant and clerk
Category 5	Computer programmer and analyst ($N=31$)
Category 6	Professional ($N=56$): day-care specialist, health planner, accountant, personnel specialist, traffic engineer
Category 7	Manager and supervisor ($N=24$)

2.4. *Validity of the job-stressor measures*

Job-title information allows us to examine the problem of self-report of stressors, that is self-report of stressors may reflect more individual feelings than do objective characteristics of job. If self-reports of job stressors vary across the seven job categories, we can conclude that self-reports of stressors have concurrent validity (Bohrnstedt 1983) and provide potentially 'good' data about job stressors. Multivariate analysis of variance on the nine stressors with the seven job categories showed that self-reports of job stressors varied across the seven job categories (Wilk's $\lambda=0{\cdot}476$, $p<0{\cdot}001$). Quantitative work-load, pressure, utilization of skills, task clarity, job control and job-future ambiguity discriminated the job categories. Computer users tended to report high levels of work pressure and job-future ambiguity and low levels of skill utilization, task clarity and job control. Programmers and analysts reported high level of work pressure, but also high skill utilization and task clarity and low job-future ambiguity. For more details see Sainfort (1990).

Why not use the job categories to determine combinations of stressors? Even if job categories vary with regard to job stressors, they do not necessarily yield the small number of combinations of stressors we are looking for. Furthermore, they may not represent homogeneous groups of jobs. Frese and Zapf (1988) warned about the difficulty of finding similar jobs. Cluster analysis provides job categories or clusters based on empirical groups rather than being arbitrarily selected by the researcher based on job-title information.

3. Results

3.1. *Choosing the number of clusters*

The CLUSTER module of SYSTAT (Wilkinson 1987) was used to perform the cluster analysis using the k-means procedure. The solutions compared were $k=2$, 3, 4, 5, 6 and 7 clusters.

(1) *Replication.* The total sample was randomly split into two samples. The two- and three-cluster solutions were similar in the two samples.

(2) *Predictive power.* The multivariate analysis of variance of the seven indicators of strain yield significant difference across clusters for all solutions. Univariate F-tests

show that all six cluster solutions yield significant differences in boredom, work-load dissatisfaction and daily life stress. The four-cluster solution also yields a significant difference in depression ($p<0{\cdot}05$). With regard to depression, the 3-, 5-, 6- and 7-cluster solutions approached statistical significance ($p=0{\cdot}114$, $p<0{\cdot}10$, $p<0{\cdot}10$ and $p<0{\cdot}10$, respectively).

(3) *Interpretation.* The 2-, 3- and 4-cluster solutions were easily interpreted. The 6-cluster solution gave a cluster with only four cases, while the 7-cluster solution gave a cluster with only three cases.

(4) *Jump in Wilk's λ.* Wilk's λ was 0·304 for $k=2$, 0·158 for $k=3$, 0·096 for $k=4$, 0·056 for $k=5$, 0·045 for $k=6$ and 0·025 for $k=7$. A graph similar to the 'scree graph' in factor analysis was plotted and showed that the 3- and maybe the 4-cluster solutions yielded 'jumps' in Wilk's λ, indicating a gain in information.

(5) *Three-cluster solution.* Based on information about the validity criteria, the 3-cluster solution was chosen. It was stable when cluster-analysis results were compared between split samples. It was related to differences in three out of seven measures of psychological strain. The three clusters were easily interpreted. There was a jump in Wilk's λ values between $k=2$ and $k=3$. It was parsimonious. The results of the cluster analysis and the means and standard deviations for each of the nine stressors and three indicators of strain for each of the three clusters are shown in table 3.

Table 3. Means and standard deviations for three clusters on stressor and strain variables.

No.	Cluster 1 ($N=112$)	Cluster 2 ($N=66$)	Cluster 3 ($N=84$)	F-ratio
Independent variables				
Quantitative work-load	3·1 (0·3)	3·0 (0·4)	2·6 (0·3)	60·7***
Attention	3·4 (0·4)	3·3 (0·5)	2·8 (0·5)	46·9***
Work pressure	2·9 (0·6)	2·9 (0·5)	2·0 (0·4)	90·2***
Utilization of skills	3·0 (0·5)	2·4 (0·5)	2·4 (0·5)	47·3***
Task clarity	3·6 (0·4)	2·7 (0·6)	3·4 (0·5)	62·5***
Job control	2·7 (0·5)	2·0 (0·4)	2·4 (0·5)	39·0***
Supervisor support	3·5 (0·4)	2·1 (0·6)	3·0 (0·5)	144·3***
Colleague support	3·3 (0·5)	3·1 (0·6)	3·1 (0·6)	4·6*
Job-future ambiguity	1·3 (0·4)	2·3 (0·8)	1·7 (0·6)	60·0***
Dependent variables				
Boredom	1·7 (0·5)	2·3 (0·6)	2·3 (0·6)	36·4***
Work-load dissatisfaction	19· (0·6)	2·1 (0·6)	1·7 (0·6)	4·9**
Daily life stress	2·1 (0·5)	2·3 (0·6)	1·9 (0·6)	11·7***

*$p<0{\cdot}05$; **$p<0{\cdot}01$; ***$p<0{\cdot}001$.

The three clusters may be described as follows.

Cluster 1: high demands (quantitative work-load, attention and work pressure), skill utilization, task clarity, job control and support, and low future ambiguity. It is similar to the 'active' jobs of Karasek (1979) Job Strain model, with the addition of high task clarity, support and low

future ambiguity. Even if demands are high, this seems to be a group of relatively non-stressful jobs.

Cluster 2: high demands and job-future ambiguity, and low skill utilization, task clarity, job control and support. It is presumably the group of the most stressful jobs.

Cluster 3: low demands and average on the other job characteristics. This cluster is an intermediary between cluster 1 and cluster 2.

Z-scores of the measures of stressors were computed to compare the three clusters' scores on the nine stressors. Figure 1 shows the Z-scores of the three clusters on the nine measures of stressors. Cluster 1 appears to be the least stressful group of jobs, while cluster 2 seems to be the highest on the scores of stressfulness and cluster 3 is between clusters 1 and 2 with regard to the stressfulness scores.

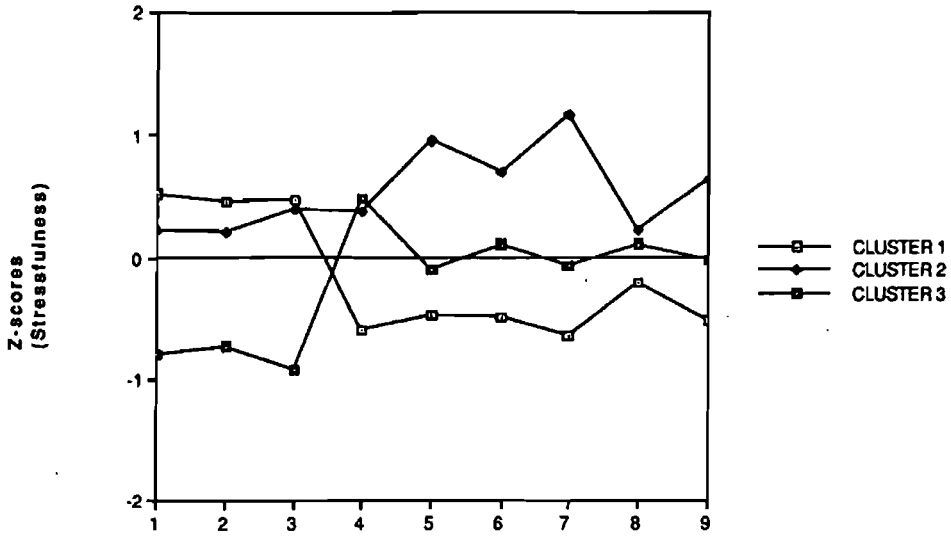

Figure 1. Comparison of the three clusters on job stressors. Z-score = [mean(cluster) − mean (total)]/SD (total) (reversed for task-clarity, job-control and social-support scales). (1) quantitative work-load; (2) attention; (3) pressure; (4) skill utilization; (5) clarity; (6) control; (7) supervisor support; (8) colleague support; (9) future ambiguity.

3.2. *Comparison of the three clusters and the job categories*

χ^2 analysis revealed that job categories were related to clusters ($\chi^2 = 47{\cdot}9$, $p < 0{\cdot}001$). Sixty percent of computer users and 33% of specialized clerks belonged to cluster 2. Fifty percent of clerk typists, 33% of general office employees and 47% of specialized clerks belonged to cluster 3. Sixty-one percent of programmers and analysts, 45% of professionals and 75% of managers and supervisors belonged to cluster 1. Computer users and clerk typists are the majority in the stressful job cluster (cluster 2), while programmers and analysts, professionals, managers and supervisors are the majority in the least stressful job cluster (cluster 1). This result seems intuitively right: data-entry operators and word processors are relatively high on various job stressors,

while professionals and managers have usually high demands, but also high utilization, task clarity, job control and low future ambiguity (Smith *et al.* 1981).

3.3. *Variation in psychological strain*

Demographic variables (age, gender, education, marital status, tenure with company and experience with current position) explained a significant proportion of the variance of only one of the seven indicators of psychological strain, i.e. boredom ($R^2=6\%$, $p<0{\cdot}05$). Older and married workers reported less boredom. The χ^2 analysis and analysis of variance revealed that the clusters were not different along the demographic variables. Therefore, we did not control for the influence of demographic variables on psychological strain.

Multivariate analysis of variance of the three clusters on the seven indicators of strain showed that the three clusters were significantly different (Wilk's $\lambda=0{\cdot}632$, $p<0{\cdot}001$). Univariate F-tests revealed that the three clusters were different on boredom ($p<0{\cdot}001$), work-load dissatisfaction ($p<0{\cdot}01$) and daily life stress ($p<0{\cdot}001$). Means and standard deviations for each of the three clusters on boredom, work-load dissatisfaction and daily life stress are shown in table 3. *Post hoc* comparisons of the three clusters were performed using the Scheffé method. The results showed that:

(1) clusters 2 and 3 reported more boredom than cluster 1;

(2) cluster 2 reported more work-load dissatisfaction than cluster 3; and

(3) cluster 2 reported more daily life stress than cluster 1 which in turn reported more daily life stress than cluster 3.

4. Discussion

Using cluster analysis we were able to find combinations of job stressors that represented relatively homogeneous groups in terms of job stressors that were related to job title information and measures of psychological strain. The 3-cluster solution yields a group of stressful jobs, high on demands (i.e. high quantitative work-load, attention and work pressure) and job-future ambiguity, and low on the other stressors; a group of less stressful jobs, high on demands but also high on skill utilization, task clarity, job control, support and low on job-future ambiguity; and an intermediary group, low in demands and average on the other stressors. The cluster of stressful jobs was higher than the other clusters on work-load dissatisfaction and daily life stress, and was higher than the cluster of less stressful jobs on boredom. The intermediary cluster was higher than the cluster of less stressful jobs on boredom, but was lower than this cluster on daily life stress. Cluster 2 (stressful jobs) was definitively associated with high levels of psychological strain, while the other two clusters were intermediary.

A combination of high demands with other stressors being low (cluster 1) led to lower boredom, but also to higher daily life stress than a combination of low demands with other stressors being average (cluster 3). Cluster 1 seems to achieve a good balance of job stressors with regard to boredom but not to daily life stress, and vice versa for cluster 3. To reduce psychological strain, demands need to be lowered for cluster 1 and skill utilization and job control increased for cluster 3. Cluster 2 represents a 'non-balanced' work system that led to a range of psychological strains. To achieve a balanced system, that is to reduce psychological strain, demands and job-future ambiguity need to be lowered, while skill utilization, task clarity, job

control and supervisor support need to be increased. Various job design and organizational design theories could be used to achieve a 'balanced' system. Job-enrichment approaches focus on improving task meaningfulness (e.g. skill utilization) and job control (Hackman and Oldham 1976), while scientific methods can be used for setting up appropriate work-load levels. For a review of job design and organizational design methods useful to achieve a 'balanced' work system, see Smith (1987) and Smith and Sainfort (1989).

The results show that job-title information is related to the clusters. The majority of the computer users (60%) belonged to cluster 2, that is the cluster of the most stressful jobs with high demands and job-future ambiguity, and low skill utilization, task clarity, job control and support. A majority of managers and supervisors (75%), computer programmers and analysts (61%) and professionals (45%) belonged to cluster 1, that is the cluster of relatively non-stressful jobs with high demands, but also high skill utilization, task clarity, job control and support, and low job-future ambiguity. These results are consistent with the results reported by Smith *et al.* (1981), i.e. higher levels of stress were found among clerical VDT workers than among VDT professionals.

Our study shows that a sample of office jobs can be characterized by a small number of combinations of stressors. Some clusters of jobs tend to have a lot of stressors. Cluster 2 appears to be the group of most stressful jobs with high demands and job-future ambiguity, and low skill utilization, task clarity, job control and social support. Cluster 1 of relatively non-stressful jobs is characterized by high demands, but also high skill utilization, task clarity, job control and support, and low job-future ambiguity. Jobs can be clustered in groups homogeneous in terms of their levels on a variety of stressors. This result indicates that certain jobs can be relatively high or low on more than one or two stressors. Therefore, a systemic approach to the study of sources of occupational stress is recommended so that jobs are fully understood and characterized with regard to their stressfulness or potential to influence worker stress. Theories or models of occupational stress that focus on a very limited number of sources of occupational stress may be doomed to failure of understanding the variety of sources of stress existing in a specific job, and therefore the ways of reducing stress. If we focus all our attention on a few stressors, our knowledge and understanding of worker reactions might be limited. This will also limit the effectiveness of our efforts in trying to reduce worker strain. Therefore, it seems fruitful to develop job stress models which examine workplace characteristics in a holistic fashion. For example, Smith and Sainfort (1989) have developed a model of job stress which examines sources of occupational stress in a systemic fashion. Sources of occupational stress include task factors (e.g. quantitative work-load and lack of job control), organizational factors (e.g. lack of participation), physical environment (e.g. noise) and the technology (e.g. low user friendliness). The balance (or lack of balance) between these factors and the individual defines the 'stress load' which can lead to stress reactions, such as mood disturbances and health problems. It may also seem useful to further understand the moderating effect of individual differences or coping styles on the relationship between job stressors and worker reactions (Kasl 1978). However, this approach is different from the one taken in this paper which examines the direct effect of workplace characteristics on worker stress.

The core statistical technique used to determine combinations of job stressors was cluster analysis. The main weakness of cluster analysis is its sensitivity to outliers (Aldenderfer and Blashfield 1984). The 6- and 7-cluster solutions gave each one

cluster with 3 and 4 cases, respectively. Analyses performed without these 'outliers' yielded similar results than analyses with them. A major methodological strength of this study was the use of multivariate analysis that takes into account co-variations among independent and dependent variables. There is a need for replication of the findings before results can be generalized to other populations. However, this study included data from three organizations and from a range of office jobs, therefore increasing the external validity of the study.

In summary, this study indicated that jobs could be classified according to their scores on various stressors, that certain jobs can be either uniformly high or uniformly low on stressors, that combinations of stressors have different relationships with the strain indicators, and that clusters of jobs are related to job title information.

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Appendix: list of questionnaire items included in the factor analysis

The amount of variance explained by each factor is given in parentheses.

Work pressure (11%)

How often do you have more than one week's work piled up for you to do? (A)
How often do you feel pushed by deadlines? (A)
To what extent do you face the following conditions in doing your own work? (B).

backlog of work
work deadlines
understaffing
production quotas or expected rates of performance.

Attention (9%)

How often does your job require your full attention? (A)
How much do you 'day dream' on the job? (B) (reversed)
To what extent does your work require you to pay extremely close attention? (B)
If you stop concentrating for a moment, how likely are you to make an error? (B)

Task clarity (5%)

How much understanding are you given of the overall work process that you take part in? (B)
To what extent does the specific material that you deal with 'make sense'? (B)

Job control (9%)

How often can you set the rate (pace) at which you work? (A)
How often can you choose the kind of work you do? (A)
How often are you able to exercise control over your day-to-day job? (A)

How often can you give inputs for decisions that affect your job? (A)
How much influence do you have over company or agency policies that affect your job? (B)

Supervisor support (14%)
To what extent is your supervisor friendly and easy to approach? (B)
To what extent do you feel that your supervisor has trust and confidence in you? (B)
To what extent does your supervisor listen to your problems? (B)
To what extent can you have trust and confidence in your supervisor? (A)
My supervisor appreciates the work I do. (A)

Colleague support (6%)
To what extent are your colleagues friendly and easy to approach? (A)
To what extent do your colleagues pay attention to you and listen to your problems? (A)

Job-future ambiguity (9%)
How often are you concerned or bothered about losing your job or being laid-off? (A)
What are the possibilities that in the next few years: (B)

your job will be eliminated
your job will be given to someone else
your job will be replaced by computers or other machines.

A: (1) Never, (2) occasionally, (3) often, (4) always.
B: (1) None, (2) a little, (3) some, (4) a lot.