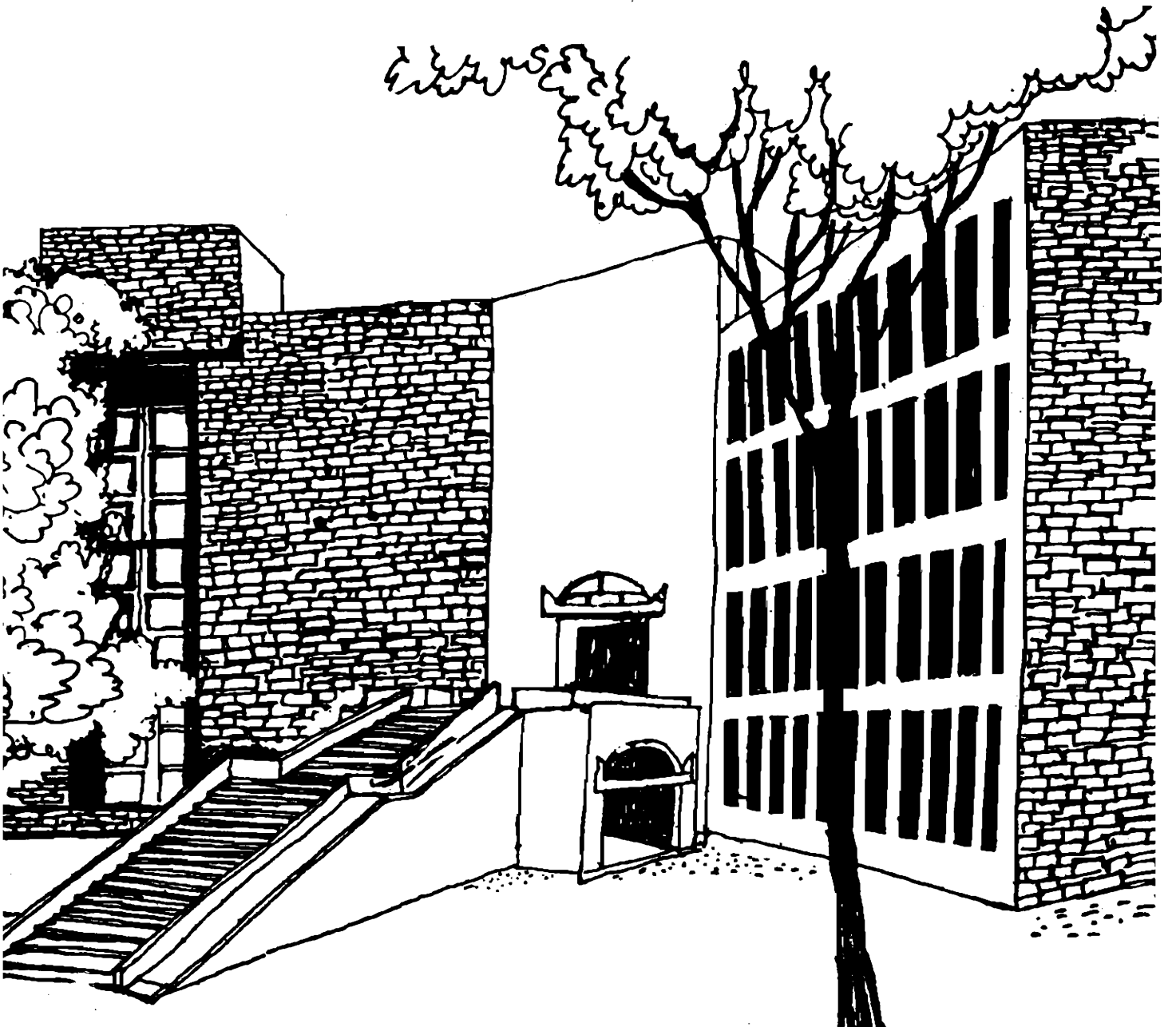




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**STRESS AND MENTAL WORKLOAD: A STUDY IN AN
INDUSTRIAL ORGANISATION**

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The main objective of the working paper series of the IIMA is to help faculty members to test out their research findings at the pre-publication stage.

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STRESS AND MENTAL WORKLOAD: A STUDY IN AN INDUSTRIAL ORGANISATION

The purpose of the study was to

- i) to identify and determine the differential response profile for three levels in management, on the different measures of stress
- ii) to identify and determine the differential response profile for the three levels in management on the different measures of mental workload ; and
- iii) to examine the relation between stress and mental workload in the three levels of management

The sample consisted of managers (level I) supervisors (level II) and assistants (level III) from a large tyre manufacturing company in northern India. Total sample comprised of 150 personnel from this organisation. Stress was measured by Jenkins Activity Survey, and mental workload by a seven point scale. Means and percentiles for stress and mental workload were used to see the differential response profiles. To see the correlation between stress and mental workload an intercorrelation matrix was generated. To find out which of the three factors of mental workload contributed to the four factors of stress a regression analysis was carried out .

M-PHIL
6 IS A PAPER ON MY UNPUBLISHED DISSERTATION ON 'STRESS AND MENTAL
WORKLOAD; A STUDY IN AN INDUSTRIAL ORGANIZATION, UNDER THE GUIDANCE
PROF. G.C. GUPTA ^{H.O.D.} DELHI UNIVERSITY.
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DRAFT.

Main Conclusions are :

- i) The higher and middle management have similar levels of stress, followed by lower management.
- ii) In case of mental workload, trends similar to those stated above (i), were found.
- iii) The 'Perceived Effort' factor of mental workload was the main contributor for the prediction of stress.
- iv) Respondents belonging to the technical departments were less stress prone, more alert and more satisfied than the respondents belonging to commercial department .

Introduction

In the last decade, the problem of executive stress has received an inordinate amount of attention in the literature of management and organisational psychology. Despite this attention, executive stress continues to take its toll of human health, human life and human enterprise.

There are numerous indications that even prehistoric humans had some awareness of the nature and process of stress, even though they had no name for it over 40 years ago, Hans Selye, the father of stress wrote his first article on stress. Ever since there have been numerous articles, studies and experiments on stress, and of course many different definitions, Wolff (1968) sees stress as a dynamic state within an organism in response to a demand for adaptation. Cofer and Apley (1964) state that stress is the state of an organism where he perceives that his well being is endangered and that he must direct all his energies to its protection. In yet another usage, it is defined as a class of conditions, producing disturbances within the individual and it is envisaged as a continuum of stimuli. Thus it may be said that

$$\text{Stressors} + \text{Individual} = \text{Stress}$$

Stress may be classified into three categories. Nuestress (nue meaning neutral) where the stress response is necessary for day to day adaptability of man to his environment; Distress (prefix 'dis' implying bad or negative feelings) where stress response is unfavourable and potentially disease producing. Eustress (prefix 'eu' implying good or healthy feeling) where the

stress response is favourable.

General adaptation syndrome (G.A.S.) is a highly complex series of interacting events which constitute the human response to any stressor. According to Selye, the GAS consists of three principle stages. In the first stage the alarm reaction is elicited from sudden exposure to stressors to which the body is not qualitatively or quantitatively adapted. The second phase is the adaptation phase, where energy utilization takes place to adapt to homeostatic imbalance. In the third phase the exhaustion phase, the reserves are depleted due to adaptation demands.

Executive stress: Executives as a class may be subject to exposure of certain type of stressors to a greater extent than other individuals. Also, executives as a class may be peculiarly susceptible to certain adverse effects of the stress response. Stress may be classified into three major categories, i.e., physiological, and psychological and environmental. This classification is overly simplistic but makes it more methodical to classify the causes. Suffice it is to say that any given incident of stress arises not from any single cause but from a constellation of interacting causes.

The effects of executive stress are not in themselves directly measurable in terms of cost; however each of them, results in and can be related to certain specifiable items of individual and organizational expense e.g. work loss, decreased productivity, restricted activity, accidents, turnover etc.

Type A Behaviour: Friedman and Rosenman in early 1960 began work on such individual stress difference and showed a relationship

between behavioural patterns and prevalence of coronary heart disease. Type A was found to be the overt behavioural syndrome or style of living characterized by competitiveness, striving for achievement with haste, impatience etc.

Load is an important contributor to stress. Load is an environmental demand experienced by the individual. French and Caplan (1973) have differentiated overload in terms of qualitative and quantitative overload. Quantitative refers to having too much to do, while qualitative means work that is too difficult. In mental workload the central concept is the rate at which information is processed by the human operator; for executives namely, the rate at which decisions are made and the difficulty in making those decisions. Intuitively, mental load is related to the extent one is 'mentally occupied', and to the effects of this occupation on the human organism. Thus, one can be overloaded, underloaded, reasonably loaded etc.

Two major types of conceptualization may be distinguished. Firstly, mental load is only related to demands in perceptual-motor tasks. The question is limited to what extent a human operator is too busy or too bored (Mackworth, 1957). Secondly, mental load is much wider, in that the task environment, with its physical components (environmental stressors) and in particular its social and emotional components (leadership, management relation, personal relations). Emotional tensions and frustrations all add to mental load. Thus there can be mental load in the absence of formal task performance.

Measures for mental load may be subdivided into three main groups - reflecting the major empirical tools of experimental psychology: (i) measures of behaviour (ii) psychophysiological measures and (iii) subjective judgments. In conclusion Sanders (1977) says that we should think in terms of pattern of mental load, upon which mechanisms are evolved. It is clearly a composite concept reflecting an end result of various contributing factors relating to the task as well as to internal human disposition and the state of practice.

Thus, seeing the recently emphasized damages of stress and mental workload on human behaviour, quantifiable in industrial and work settings, a study was done on stress in relation to mental workload in industry.

The Study

Objectives

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1. To study the differential response profile for the three levels of management, on the different measure of stress.
2. To study the differential response profile for the three levels in management on the different measures of mental workload.
3. To examine the relation between stress and mental workload in the three levels of management.

Sample

The present study was conducted in a large industrial concern located in North India. The respondents were from the

commercial and technical sections of the firm involved in different levels of management.

The stress questionnaire and the scale of mental workload was administered to the three levels in management.

Level I (30 respondents) - higher management which included branch managers and section managers.

Level II (70 respondents) - middle management which included assistant managers of the supervisory level.

Level III (50 respondents) - lower management which included lower division clerks and technicians. The number of respondents could not be the same for each level due to the unequal numbers in the employee classification chart and different levels of literacy specially in level III. Half of each category belonged to the commercial section and the other half to the technical section.

Methodology

Measure: JAS or Jenkins Activity Survey Form C was employed to measure stress. In addition to providing Type A score, the JAS also provides separate factor scores for the three components to Type A behaviour i.e. (a) speed and impatience factor (S) (b) job involvement factor (J) and (c) hard driving and competitive factor (H). This form (C) is easy to administer to both individual and groups and is suitable for use with currently or recently employed adults who can read at an eighth grade level or better. The Jenkins Activity Survey was developed in an effort to duplicate the clinical assessment of Type A behaviour by a more psychometric procedure and to make Type A assessment

accessible both to individual practitioners and to researchers conducting large scale studies.

Mental workload: In most applied studies a simple method is needed that can be used by everyone, not only by subjects who have a superior capacity to handle and express perceptual relation in ratios. One such method is a category rating scale called RPE (Ratings of perceived exertion). It varies from 6 to 20 to match the heart rate variation from 60 - 200 beats/minutes. Every second number is anchored with such verbal expressions as 'fairly light' 'somewhat hard' etc. In one of the first validation studies, a correlation of .85 was obtained between RPE rating and heart ratio (HR) during ergometer work. With the help of this scale, three aspects of mental workload were measured (a) perceived effort (b) wakefulness or alertness and (c) job satisfaction.

The RPE scale was intentionally constructed to match a psychological scale to a highly reliable and valid physiological variable so that its value follows the physiological variation closely. Hence HR grows linearly with physical work load ; RPE does so as well.

The RPE scale has been used in many studies in several different countries for different kinds of work, different age groups and different clinical groups. In one of the first validation studies, a correlation of .85 was obtained between RPE ratings and heart rate during ergometer work. In later studies, correlations of the same magnitude have been found wherever a wide range of stimuli variation (physical strain) has been used. (Borg & Noble, 1974).

Data on JAS were scored on four factors. The scores obtained were converted into standard scores from the manual and further converted into percentiles means.

Mean ratings on the three variables on which mental workload has been assessed, was generated to see the differential response profile of the three levels of management. An intercorrelation matrix was generated employing the four JAS factors and three variables of mental workload separately for each of the three levels of management to find out which of the three factors of mental workload, contributed to each of the four factors defining stress. A regression analysis was carried out on each of the four factors as the criterion dependent variable, separately for the three levels.

Results and Discussion

Table 1, shows the means in percentiles (converted from standard scores) and S.D., for the three levels in management for the four factors of stress measured by the JAS questionnaire. For Type A behaviour, the percentiles of both middle and higher management was 65. Similar trends were found in the other three factors, viz speed and impatience, job involvement and hard driving behaviour. The findings that respondents in both high and middle management have been placed in the same level is interesting and in a way contrary to expectations. However, considering that middle management is more competitive and hard driving due to the nature of the job demands, especially in view of built-in strivings to compete to reach the top. Higher

management is under stress for a different set of demands especially in new of the quality of decision making that they have to do. The findings are different to what Ware (1979) in an unpublished research report in USA found in a study on managers and professionals of a major auto manufacturing company where the score on Type A was on the 50th percentile. The lower management was much lower (45th percentile) as compared to these two levels, indicative, on a comparative scale, that they were not so highly stressed ; thus then proness to heart disease is much lower than the other two levels. This is corroborated by looking at the profile of the other three factors of stress; they are less impatient and alert and less involved in their work as a direct outcome of the kind of work, which needs less attention, low risk taking and decision making. Kiev and Kohn (1979) in an AMA Survey report found similar results on their study on managers.

From Table 2, we can see that even in mental workload, the factors of perceived effort, alertness and job satisfaction, all decreased from high to low management. From Table 3, where the intercorrelation matrix is exhibited for higher management, perceived effort has been found to be correlated very significantly to three factors of stress, viz. Type A, Job involvement and hard driving behaviour, providing a support to the relationship between stress and mental workload. With an increase in stress, a corresponding increase in mental work load was observed. This finding is in keeping with the assumption that people under stress perceive their work to be more difficult and thus feel they are putting in more effort. This is confirmed

by the findings of the regression analysis of Table 4 which shows that the perceived effort variable of mental work load contributes significantly towards Type A and hard driving behaviour factors of stress.

The factors of alertness has been observed to contribute significantly towards the speed and impatience factor of stress as seen from the regressions. In the middle management, the positive correlation of perceived effort with three factors of stress i.e. Type A behaviour, speed and impatience and hard driving behaviour, indicates that with a rise in these three factors, there will be a corresponding rise in the perception of effort (Table 5). This is confirmed by the regression analysis, which shows the significant contribution of perceived effort in predicting Type A behaviour, speed and impatience and hard driving behaviour for middle management. Alertness has also been found to contribute to Type-A behaviour.

In lower management (Table 6) significant correlation between all the four factors of stress with perceived effort indicate that with an increase in these factors of stress there will be corresponding increase in the perception of effort. Thus on looking through the regressions, the significant contribution of perceived effort to the factors of stress is confirmed, in all the three levels. The other two factors did not show any consistency in this respect. Amongst the earlier reports Business Week (November 15, 1976) reported that coronary heart disease has been linked to such factors as work pressure, heavy work load and responsibility for managing people. The evidence of

CHD increases with age, however since the age of managers is dropping, the incidence of CHD among younger individuals is climbing indicating that stress factors in the management role are taking their toll on health in even younger executives. Moss (1972) reports that mental work load stands out as a type of role conflict which confronts a sizeable number in the labour force. 45% of the male wage earners indicate being disturbed about feeling that they have too heavy a work load, one they can't probably finish during an ordinary work day and 43% are distressed thinking that the amount of work they have to do may interfere with how well it gets done. An accounting manager summarized it well - "I have more work to do than I can get done well enough to satisfy my standards of quality".

In case of subjects scoring above the 80th percentile on type A behaviour in the present study, it was hypothesized that a significant relation between their mental work load and stress would emerge. The findings are contrary to expectations. In studies by Semruer (1982) in 'Stress At Work, Stress in Private Life and Psychological Well Being', and Kunstler and Zimmer (1982) in 'Towards the analysis of motivational influence and coping with mental load' stress has been found to be complexly determined by the nature and quality of job demands that the personnel in different positions are confronted with. These findings may explain the insignificance of the relationship *in the present S*. Another reason may have been that the samples in extreme groups were too small to establish something of significance.

Sinha (1983) did a similar study in Jamshedpur in a public

sector undertaking (TISCO). In her sample the top management was even higher in stress than the sample in the present study and middle management was lower than that recorded by us.

Conclusion

1. The higher and middle management samples were on the same percentile level on Type A behaviour, an indicator of stress, followed by the lower management sample.
2. The same trend was found for mental work load.
3. Perceived effort, a factor of mental work load was the main contributor to the prediction of the stress.
4. The personnel in the technical section were under less stress and were more alert and satisfied with their jobs than those in the commercial section.

The data obtained provide evidence that higher and middle management is highly stressed and their perception of the effort they are putting into their work is high. Thus it is important to introduce and encourage stress releasing activities in office or at leisure hours. These may be of two kinds i) using drugs under medical supervision, ii) without using drugs e.g. Biofeedback techniques, Acupuncture, Yoga, Meditation, Exercises etc.

Table 1

Means converted to Percentiles & SD's for three levels in management on four factors measured by JAS.

Levels in Management	Values of	A1	A2	A3	A4
Higher	Percentile	65	50	50	80
	S.D.	4.58	7.11	7.58	9.34
Middle	Percentile	65	40	45	75
	S.D.	5.35	7.59	7.90	11.59
Lower	Percentile	45	30	30	50
	S.D.	5.79	7.48	7.29	9.40

Where A1 = Type A
 A2 = Speed and impatience
 A3 = Job involvement
 A4 = Hard driving

Table 2

Means and S.D. for the three variables of mental workload

Levels of management	Values of	A5	A6	A7
Higher Level	Mean	16.97	17.87	15.50
	S.D.	1.42	0.92	1.45
Middle Level	Mean	15.88	17.05	14.61
	S.D.	2.14	1.98	2.57
Lower Level	Mean	14.14	15.54	13.67
	S.D.	2.10	2.09	2.36

Table 3

Intercorrelation matrix of factors of stress and mental workload - Top Management

Variables	A1	A2	A3	A4	A5	A6	A7
A1	-	.033	.383**	.567**	.645**	.193	.234
A2		-	.305**	-.564**	-.079	-.434**	-.279*
A3			-	.031	.344**	.017	.004
A4				-	.572**	.287	.281*
A5					-	.301*	.185
A6						-	.249*
A7							-

A5 - Perceived Effort
A6 - Alertness
A7 - Job Satisfaction

Table 4

Regression coefficients of three factors of mental workload, A5, A6, A7 on type A behaviour (A1) as the criterion variable in higher management.

A1 - A5.A6.A7	Coefficients	St. Error	T-value
BETA (1) A5	-2.02	0.50	4.03**
BETA (2) A6	0.14	0.78	0.17
Sigma Sq. = 13.81	Sigma = 3.71		df=26,
R. Square = 0.43	R-Bar-Sq = .364		F= 6.54**

** Significant at .01 level.

Table 5

Intercorrelation matrix of factors of stress and mental workload - middle level

Variables	A1	A2	A3	A4	A5	A6	A7
A1	-	.330	.023	.330**	.616**	.288**	-.088
A2		-	.083	.265**	.412**	.010	-.028
A3			-	-.078	-.011	.101	.047
A4				-	.345**	-.118	.176
A5					-	.102	.023
A6						-	.013
A7							-

Table 6

Intercorrelation matrix of factors of stress and mental
workload - lower level

Variables	A1	A2	A3	A4	A5	A6	A7
A1	-	.258**	.444**	.655**	.613**	.087	.144
A2		-	.510**	-.154	.234	-.104	.075
A3			-	.417**	.350**	+.229**	.150
A4				-	.445**	.153	.196*
A5					-	.144	-.066
A6						-	.285**
A7							-

* Significant at .05 level df = 98

** Significant at .01 level df = 98

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