

Intrinsic Job Stress and Diastolic Blood Pressure Among Female Hospital Workers

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The present study of 375 female hospital workers assesses the impact of two specific dimensions of vocational stress on standing diastolic blood pressure. Both intrinsic (pertaining to job content) and extrinsic (associated with job context) stressors were examined in this study. Diastolic blood pressure was found to be significantly related to scores on an intrinsic stress measure, but not with the extrinsic one, even after the contribution of obesity and age levels were controlled. However, the effect of intrinsic stress was only found to be significant among women younger than 35. We believe this to be preliminary evidence that perceived dimensions of chronic intrinsic role stressors can be significant psychosocial correlates of diastolic blood pressure.

During the last few decades there has been continuing research interest in the impact of vocational stress on personal health and well-being.¹⁻³ Stressful life events of an acute nature have been shown to yield changes in various cardiovascular parameters.^{4,5} Although the studies of the relationship between situational stressors and physiologic variables are numerous,^{3,6} the difficulty of studying the physiologic effects related to a work situation, presenting chronic stress factors, has slowed research efforts in this area. A number of studies in organizational settings have looked at the association between various stress factors and objective physiologic responses in blood pressure, heart rate, and/or hormonal secretions^{3,6} but no significant relationship has been established between perceived chronic occupational stress and blood pressure.^{7,8} Most of the work in the

occupational area has focused on subjective responses such as emotional or physical discomfort. Yet, the known interpretative difficulties arising when both stimulus and response data are collected from self-reports^{3,9} point to the necessity for collecting information based on more objectively measurable health indices such as blood pressure.

Moreover, the great majority of studies in the field of occupational stress have concentrated on a population consisting mostly of men. Data drawn from a predominantly female population are rare,¹⁰ with the exception of those found in studies done in a hospital environment.¹¹⁻¹³

In the controlled experimental laboratory setting, diastolic blood pressure has been found to rise when subjects were exposed to acute psychologic stresses such as difficult or frustrating cognitive tasks.¹⁴⁻¹⁶ On the other hand, changes in systolic blood pressure have been particularly notable among individuals demonstrating type A coronary artery disease prone behavior.¹⁷⁻²¹ However, the few major studies of the association between chronic occupational demands and health report no significant relationship between stress and recorded arterial pressure.^{7,8}

This study examines two different sources of stress in relation to their health sequelae. Based on previous research, Arsenault and Dolan^{22,23} have made both a conceptual and an empirical distinction between intrinsic pressures related to job content and extrinsic sources which are more related to job context. Intrinsic stress in a hospital environment includes such factors as contacts with very ill patients, risky decisions or threatening tasks, quantitative overload, and responsibility. Extrinsic stress in the hospitals studied refers to such pressures as role ambiguity and conflicts, restrictions on autonomy, and pay inequity. Complete descriptions of all scales included in these indices have been published.²²⁻²⁴ It has been shown that intrinsic stress is associated with a significant decrease in absenteeism

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(coping by involvement), whereas extrinsic stress is correlated with increased absenteeism (coping by avoidance).²³

The present study also considers the effect of age and obesity on the relationship between work stress and blood pressure. These elements had not been specifically addressed in previous work. Among women, previous research indicates that age is curvilinearly related both to blood pressure as well as to obesity, which itself influences blood pressure. Diastolic blood pressure tends to rise most rapidly among middle-aged, 40 to 55-year-old female populations.¹⁷ Obesity, a factor linked with blood pressure, also begins to rise at an accelerated pace among these middle-aged groups.^{25,26} These age-related phenomena may cloud the identification of stress effects on blood pressure.

This study explores the relationship between both sources of stress and diastolic blood pressure, while controlling for age and obesity. Our objectives were derived from preliminary results drawn from an unpublished pilot study, based on 125 subjects, which had already shown a significant correlation between intrinsic stress and standing diastolic blood pressure. This correlation was not significant with either systolic blood pressure (standing and lying) or lying diastolic blood pressure. This study specifically focuses on mean diastolic blood pressure measured in the standing position (MSDBP).

Methods

Subjects

Three hundred seventy-five female hospital workers aged between 20 and 64 years old (mean = 32.0 ± 14.8) were subdivided into three age groups: 226 below 35 years of age, 110 between 35 and 49 years old, and 39 above 50 years old. The reason that those cutpoints were chosen derives from the Framingham study,²⁵ which showed that the increase in blood pressure in women between the ages of 35 and 50 was different from the other age groups. Inclusion criteria were absence of known personal history of hypertension, and job seniority of at least 6 months in a post involving a minimum of 25 hours per week. Hypertensive subjects were eliminated to minimize possible influence of medical regimen or drugs on blood pressure. Minimal job seniority criteria were utilized to ensure that all subjects had benefited from a minimal adaptation period of at least 6 months.

Procedures

Subjects took free time (lunch or end of shift) during their work day to complete a questionnaire supplying personal background such as age, medical history, and job status. The main body of the questionnaire consisted of 15 scales selected and designed for this worker population and published elsewhere.²³⁻²⁴ Only psychosocial

work stressors pertinent to hospital work environment were retained. Linguistic pressure, characteristic of the Quebec work environment, was added. A full description of all scales employed, including their central tendency characteristics and internal reliabilities, is reported elsewhere.^{23,27} The number of Likert-type questions in each scale is given in parentheses.

Seven scales relating to job content include contact with very sick patients (3),²⁷ urgent decisions (2),²⁷ physical risks (2),²⁷ job participation (4),²⁸ job responsibility (4),²⁷ quantitative workload (4),²⁷ and threat by difficult tasks (2).²⁷ Eight scales relating to job context include restrictions on behavior (3),²⁷ skill under-utilization (3),²⁹ career ambiguity (3),³⁰ workload instability (3),²⁷ pay inequity (3),⁸ role ambiguity (4),³¹ linguistic pressure (3),²⁷ and role conflict (3).³¹ The various scales were combined into two summary indices. Psychometric justification for the derived composite indices has already been published.²³ The intrinsic (job content) and extrinsic (job context) stress indices consist of standardized mean scores across the seven and eight respective relevant scales. The intrinsic stress index ranges from 1.1 to 3.5 with a mean score of 2.5 and a standard error of 0.4. The extrinsic stress index ranges from 1.1 to 3.3 with a mean score of 1.9 and a standard error of 0.4. Intercorrelation between the two indices is 0.28.

A short physical examination was carried out by trained nurses immediately after the subjects had filled the questionnaire. Height and weight measurements necessary for calculating an obesity index were recorded. The obesity index was calculated as follows:

$$\text{Obesity index} = (\text{weight/height}^2) \times 100^{8,32,33}$$

The diastolic blood pressure was measured once on each arm using a standard mercury gravity sphygmomanometer, in a standing position, then five minutes later in a lying position. Subjects with a difference of 10 mmHg or more between arms were excluded. For all other subjects the mean value between both arm readings was calculated. For reasons justified previously, we report results on mean standing diastolic blood pressure.

In this study, stepwise inclusion analysis was used to obtain a regression analysis adjusted for both obesity and age, based on known hypothesis on the relationship between these two variables and blood pressure.²⁶ After obesity and age had been entered in the equation, the only two independent variables were intrinsic and extrinsic stress.

Results

Means and standard deviations for intrinsic stress, extrinsic stress, MSDBP, and obesity index are presented in Table 1. Statistics for the entire sample are presented first, followed by the three age subgroup (under 35 years, 35 to 49, and over 50). The mean values for both intrinsic and extrinsic stress indices are very stable across all three age groups. There appears to be a slight tendency for the obesity index to increase

TABLE 1
Intrinsic and Extrinsic Stress, MSDBP, and Obesity Index, for All Subjects and by Age Groups

	N	Intrinsic Stress		Extrinsic Stress		MSDBP		Obesity Index	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
All subjects	375	2.5	0.4	1.9	0.4	78.3	10.0	3.2	0.6
Age groups									
Younger (<35 yr)	226	2.4	0.4	1.9	0.3	77.0	9.3	3.1	0.6
Middle-aged	110	2.5	0.4	1.9	0.4	79.6	10.3	3.3	0.5
Older (>50 yr)	39	2.5	0.3	1.8	0.4	82.7	11.6	3.4	0.5

with age. As expected, diastolic blood pressure tends to increase with age. Here, mean values only serve as an indication of the trend. The standard deviations are quite large because each group contains age values spread over more than a 15 year span. The best estimate of the association between age groups and MSDBP is given by the regression analysis. However, comparison of the blood pressure values in this study with the values from the Society of Actuaries³⁴ shows that our sample falls within 1 SD of the expected values for the general population. However, there is a slight tendency for diastolic blood pressure to be somewhat higher than expected in the younger group of female workers.

Table 2 presents the Pearson correlation matrix for all variables under study. The correlations between the two stress indices being the largest (.28), we have decided to keep both predictors in the stepwise regression analysis as discussed below. The control variables (age, obesity) are slightly correlated (.17). However, the two control variables do not appear to be significantly related to either stress index. Finally, with regards to diastolic blood pressure, obesity, age, and intrinsic stress seem to be significant correlates. However, this correlation matrix does not take into account their relative predictive value on diastolic blood pressure.

Table 3 summarizes the results of a stepwise inclusion regression analysis when the two stress indices compete for the prediction of diastolic blood pressure after adjustment is made for obesity and age. Moreover, to assess possible age variations, separate regression analyses were conducted for each age group. For all subjects, obesity appears to be the strongest predictor followed by age. After inclusion of those first two control variables, a significant proportion of the residual variance of MSDBP is explained by intrinsic stress.

The relative importance of the predictors appears to vary from one age group to another. Table 3 shows that, for the younger group, obesity and intrinsic stress both play a significant role. For middle-aged workers, only obesity remains, whereas only age acts as a predictor in female workers over 50.

Discussion

Our results support the already well-documented evidence of age and obesity as significant predictors of diastolic blood pressure.^{25,26} It is striking that we find a similar age-related risk profile for obesity and blood pressure as reported in the Framingham study.²⁵ Con-

TABLE 2
Correlations between Intrinsic Stress, Extrinsic Stress, Obesity Index, Age, and MSDBP

	Intrinsic Stress	Extrinsic Stress	Obesity Index	Age
Extrinsic stress	0.28*	-	-	-
Obesity index	0.02	0.03	-	-
Age	0.08	-0.10	0.17*	-
MSDBP	0.13*	0.07	0.25*	0.20*

* Significant at $P < .05$.

TABLE 3
Stepwise Regression of MSDBP on Age, Obesity Index, Intrinsic and Extrinsic Stress, for all Subjects and by Age Groups*

Variable	Slope	SE	P	
All subjects				
Step 1	Obesity index	3.98	0.90	.001
Step 2	Age	.76	0.25	.01
Step 3	Intrinsic stress	2.70	1.19	.05
Age groups				
Younger (<35 yr)				
Step 1	Obesity index	4.42	1.07	.001
Step 2	Intrinsic stress	3.17	1.37	.05
Middle-aged				
Step 1	Obesity	3.83	1.77	.05
Older (>50 yr)				
Step 1	Age	7.65	2.55	.01

* When all subjects are considered, obesity is the strongest predictor, followed by age and intrinsic stress. Extrinsic stress does not enter the equation. The three age groups tend to differ from one another.

sequently, even though this sample was not designed to be representative of the population of women, we can safely state that it was probably not strongly biased.

The stepwise regression on all subjects shows that age remains a significant predictor even after obesity has been taken into account. Consequently the significant correlation between age and obesity (see Table 2) does not exclude a specific contribution of age to the prediction of diastolic blood pressure.

Moreover, this study offers support for an additional predictor of standing diastolic blood pressure in female workers, namely the potential impact of job related stressors. This impact appears to be dependent on the type of vocational stress involved. Stressors arising from job content (eg, contact with very sick patients, a sense of responsibility toward people, the frequency of participation in decisions), appear to have greater bearing

whereas stressors related to job context and environmental role conflicts do not.

Given the aggregate nature of an index of intrinsic stress, such a correlation might be spurious. However, the same results were obtained in our pilot study of 125 workers and would therefore corroborate the stability of intrinsic stress as a predictor. Another argument pointing to the validity of this index stems from its reported significant correlation with a decrease in absenteeism.²³ In fact, the negative correlation between intrinsic stress and absenteeism was found to be reproducible in a test-retest survey done 6 years later on a sample cohort of the same hospital workers.²⁵

From clinical experience, it is noteworthy that workers perceiving themselves as subjected to high levels of intrinsic stress have a tendency to extend their normal working hours, postpone their holidays, and show up at work even though they would feel justified in not doing so. We therefore have a tendency to consider intrinsic stress as a valid construct and define it as an approximate measurement of the challenging aspects of job content. The variance explained by intrinsic stress is small but we believe our results justify research efforts to further refine its measurement.

Although stepwise regression analysis done on age groups is exploratory, the results shown in Table 3 would tend to indicate that the predictive value of obesity, age, and intrinsic stress varies from one age group to another. In fact, intrinsic stress would appear to play a significant role only in the younger age group.

One potential explanation for this age difference may be related to the growth of coping skills as well as attrition. It is likely that younger employees have shorter work histories and have thus had less opportunity to develop strategies and habits for dealing with chronic intrinsic stress. In contrast, older workers are likely to have developed a broad array of skills for handling these difficulties due to their longer experience. Furthermore, it might be expected that the self-selection process has removed workers who have not developed these needed skills. Such reasoning indirectly supports the case for intrinsic stress as being a specific risk factor for the younger female hospital worker. Together with our reported results on absenteeism,^{23,24} these findings lead us to the conclusion that intrinsic stress is a predictor of a coping syndrome characterized by increased involvement in the job and a chronic psychosomatic problem of relaxation as measured by standing diastolic blood pressure.

We believe that such a clinical pattern might be inductive to "workaholicism" and might constitute a potential risk of hypertension for this group of young professionals. A prospective follow-up of our cohort might bring new evidence in this regard.

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Boundary-making for AIDS Victims

A nation under attack by a foreign enemy unites in opposition. The country's boundaries become walls against invaders. With AIDS, the U.S. faces a civil war, an urging to create a biological boundary through a community, not around it. As unifying as external attack may be, the spread of a biological contaminant within a nation breeds suspicion, fear and desperate action often not responsive to reason.

Quarantines of the past are reasonable guides to future tensions over the spread of AIDS. Quarantines reveal a range of responses to biological danger depending on the length of an attack, consequences for the infected, and social characteristics ascribed to those who are believed to spread the disease. We should not think of quarantine as limited to signs on a front door of a home with a child who has scarlet fever. Quarantine for childhood disease, a public-health measure now rarely employed, is insignificant compared with the demand for anti-AIDS boundary-making that may develop over the next decade.

... What can be said about the prospects of quarantine in the instance of AIDS? AIDS has characteristics that in the past have led to isolation of victims: It is linked to groups rejected by much of society—homosexuals and intravenous drug users; it is a disease of great danger that most often is transmitted in ways that have been outlawed as illicit practices; and it is an illness that may well exist for decades, endangering larger and larger numbers

It is true that AIDS in the U.S. has characteristics that make a quarantine illogical: It cannot be spread by casual contact; it has not been proved that all people who test positive for AIDS antibodies will go on to develop the full-blown disease; the number of exposed people in some cities is already so high that a quarantine would be extremely expensive and impractical.

But logic and concerns for civil rights and liberties may fall by the wayside and a demand for quarantine may arise as deaths from AIDS mount. Averting this pressure will require great political skill. For by that time, the enemy within may be panic and disorder as much as AIDS.

—From "AIDS and Panic: Enemies Within" by David F. Musto, MD, in *The Wall Street Journal*, April 28, 1987

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Research Note

Implementing computer-based automation in the office: A study of experienced stress

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Summary

This study focuses on the impact of previous experience with automation implementations on experienced stress associated with different work aspects, following the introduction of computer-based office automation.

One hundred and ninety-one full-time secretaries at a large university in Canada completed questionnaires related to stress perception and prior experience with office automation. Results indicated that those without previous experience reported higher levels of experienced stress associated with work content aspects such as task difficulty and interest in the task, whereas those with prior experience reported greater problems with contextual aspects such as training and instruction.

These findings are discussed in the context of research on technological change as a source of organizational and occupational stress.

Introduction

Interest in the concept of organizational stress has grown significantly during the last decade, presumably because it is implicated in the etiology of many diseases such as cardiovascular disorders, hypertension and psychosomatic ailments (Cummings and Cooper, 1979; Glass, 1977; House, McMichael, Wells, Kaplan and Landerman, 1979; Schuler, 1980).

Much research effort has been invested in attempts to identify organizational and occupational factors that may be related to the probability that an individual will experience stress at the worksite.

Technological changes such as the introduction of computer-based office automation have been recognized as a source which may induce the experience of stress (*cf.* Tosi, Rizzo and Carroll, 1986). Yet, to date, little attempt has been made to empirically ascertain just how technological changes such as introduction of office automation relate to experienced stress associated with

different occupational and organizational aspects. Furthermore, it would be only warranted to pose the question of what in the technological change it is that generates stress. It appears reasonable to assume that the ambiguity and the uncertainty about performance expectations likely to emerge from the change, carry the intermediary role of exacerbating organizational stress. Capitalizing on Beehr and Newman (1978), however, we may speculate that previous exposure to and experience with implementations of automation in the office can mitigate possible adverse present outcomes from office computerization, such as feelings of losing control over the job.

It has therefore been the specific goal of the current study to probe the impact of previous experience with office automation implementations on experienced stress associated with different organizational and occupational aspects.

Method

Subjects

A total of 191 secretaries working for at least 6 months in a large Canadian university undergoing office computerization, participated in this study. Subjects ranged in age from 22 to 38 years ($M = 33$) and had had from 9 to 17 years of education ($M = 12$). Job seniority ranged from a minimum of 3 years to a maximum of 10 years, with the majority having 3 years on the job. Of these secretaries, 137 (72 per cent) had had no prior experience with office automation technology, while the remaining 54 (28 per cent) had had at least some contact (e.g. had worked with IBM electric typewriters, had operated Xerox copiers).

Measures

A self-report questionnaire was especially designed to assess experienced stress associated with different organizational and occupational aspects, due to the absence of extant instruments in the field of occupational stress (*cf.* Arsenault and Dolan, 1983a). Ten such aspects were identified from content analysis of the literature on occupational stress (Caplan, Cobb, French, Harrison and Pinneau, 1980; French, Caplan and Harrison, 1982; Ivancevich, Matteson and Preston, 1982; Lazarus, 1966; House, 1981; Schuler, 1980; Shirom, 1982). Four to seven items were then constructed for each aspect, generating a total of 63 items. The respondents rated each on a five-point scale (1 = strongly disagree; 5 = strongly agree) regarding the extent to which introduction of micro-computer and word processor created stress in that context. (For a detailed description of the process of deriving the questionnaire items and results of their test on other samples see Arsenault and Dolan, 1983a,b). In light of the high internal reliabilities of the items pertaining to each of the 10 aspects, measure scores were formed as the linear sum of the relevant items. Table 1 displays the 10 measures, representative items, their mean and their internal reliability in terms of Cronbach alphas.

The technological change

The computer-based automation of the office, in the present context, consisted of switching from

- (1) non-electric typewriters to the use of word-processors for any material typing, and
- (2) turning from hand-documenting information on students and faculty members in regular

Table 1. Stress measures: item contents and internal reliability

Measure	No. of items	Example of a typical item	Chronbach's alpha
Training and information	5	The University's authorities train and inform adequately before implementing new technology	0.81
Task difficulty	7	All in all I do not foresee any difficulties in adapting to a new word-processor	0.82
Interest in task	4	With a word-processor, my work will become more routine and monotonous	0.73
Work load	6	The new technology will require a higher volume of output	0.73
Autonomy	6	The new technology will control the management of my time	0.84
Job security	4	The University will take advantage of new technology in order to reduce personnel	0.68
Wages	5	The new technology will lead to employee's 'underpayment' in relation to work accomplishments	0.72
Health and safety	7	Research has demonstrated that word-processors affect the health of their users	0.87
Organization of work, social realtions	7	With the introduction of new technology, I will be more isolated in my work	0.86
Career path	6	The implementation of new technology will reduce possibilities for promotions	0.79

dossiers to the utilization of micro-computers for keeping records (e.g. personal files, academic achievements, etc.).

Results

Table 2 presents comparison of experienced stress among secretaries with and without previous experience with automation implementation, for the 10 measures. Review indicates that highest stress levels are associated with aspects of wages, job security, health and safety, and training. Least stress was associated with task difficulty, career path, and autonomy.

As could have been anticipated, those without previous experience reported significantly higher experienced stress with regard to aspects such to task difficulty, interest in work autonomy, health and safety, and career path. Yet, contrary to what may have been expected, those with experience showed greater experienced stress on the aspect bearing on issues of training and information.

Discussion and Conclusions

The present study provides empirical evidence to an area of research which has been understudied by behavioural science specialists. Our respondents evidently experienced stress associated with

Table 2. Experienced stress on occupational and organizational aspects by level of prior experience with office automation change

Measure	Experienced		Inexperienced		<i>t</i>
	<i>M</i>	<i>S.D.</i>	<i>M</i>	<i>S.D.</i>	
Training and information	3.6	0.83	3.3	0.78	-2.74*
Task difficulty	2.3	0.65	2.5	0.69	1.82*
Interest in work	2.9	0.80	3.2	0.81	2.92*
Work load	3.2	0.82	3.3	0.64	0.46
Autonomy	2.7	0.83	2.9	0.77	2.03*
Job security	3.5	0.83	3.6	0.78	1.31
Wages	3.9	0.68	3.7	0.77	-1.38
Health and safety	3.2	0.91	3.6	0.76	3.41*
Organization of work, social relations	3.1	0.70	3.3	0.78	1.95
Career path	2.6	0.73	2.8	0.75	2.06*

* $p < 0.05$.

different occupational and organizational aspects, following introduction of the computer-based automation in the office.

Furthermore, the comparative analysis between responses given by the two groups of secretaries illustrates the impact of some notion of the essence of the planned change in reducing the experienced stress. Secretaries without prior experience with implementation of office automation fear a possible deterioration in the quality of their work life, as reflected by anticipation of work becoming more difficult (i.e. task difficulty), fear of job turning into more routine (i.e. interest in the task) and fear of control over work being shifted from their hands to the computer-based devices (i.e. autonomy) and fear of restriction of promotion opportunities (i.e. career path).

Conversely, the secretaries experienced with a prior automation change had a rather realistic notion of the nature of the upcoming change, which made them apt to regard the implementation of computer-based automation as not posing a considerable threat. Their concern over getting a proper training and information provides a further reinforcement to the reasoning of this finding. Aware of what the introduction of computer-based automation would entail, they apparently knew how important it would be to get a rigorous training and sufficient information on how to operate the new technology so that they would succeed in mastering the principles of the devices' operation.

Resistance to the shift from the industrial era to the information society is a known fact. The major conclusion to be drawn from this study is that the stressful effects of the shift to computer-based automation could be mitigated, and adaption might be smoothed by providing proper information and training programmes to those involved prior to introducing the technology change. In doing so, we may be able to dissipate occupational ambiguity emanating from the automation change alleged to be a source of stress (Kemery, Bedeian, Mossholder and Touliatos, 1985) which in turn may explain the resistance to implementation of new technologies as evidenced and revealed by other researchers (e.g. Coch and French, 1948).

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