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OCCUPATIONAL STRESS, SOCIAL SUPPORT, AND THE COSTS OF HEALTH CARE

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Relationships among health care costs, social support, and occupational stress are investigated. Health care cost data were collected over two years for 260 working individuals. Multiple regression analyses were used to control for initial health care costs, age, and gender in predicting later costs; independent variables were stress, strain, social support, and their interactions. Main effects and interactions each accounted for significant proportions of the variance in various health care costs.

A general presumption of the occupational stress literature is that personal work stress and strain ultimately lead to failing individual health and illness (e.g., Cooper & Marshall, 1976; Fletcher, 1993; Ganster & Schaubroeck, 1991; Greenberg, 1977; Kasl, 1984). Some empirical support exists for this relationship. A recent National Institute of Mental Health document, *Neuroimmunology and Mental Health* (Vitkovic & Koslow, 1994), summarizes literature concerning the relationship between stress and susceptibility to disease. Ganster and Schaubroeck (1991) conducted a review of work stress and employee health and concluded that strong indirect evidence exists that stress causes illness. Those authors also charted the history of research on work and stress.

Organizational and clinical researchers alike are calling for an appropriate and specific model for judging the effects of stress on immune system responses. Although such a model does not currently exist, the findings of the studies cited here generally follow the conceptual framework of Matteson and Ivancevich (1982). Its major parts are outlined in Figure 1. The model suggests that personal (for instance, age and gender) and external sources of stress (in a work setting, these may include physical and job factors) influence stress as experienced, which in turn can affect potential outcomes, with implications for physical, psychological, and organizational factors. Al-

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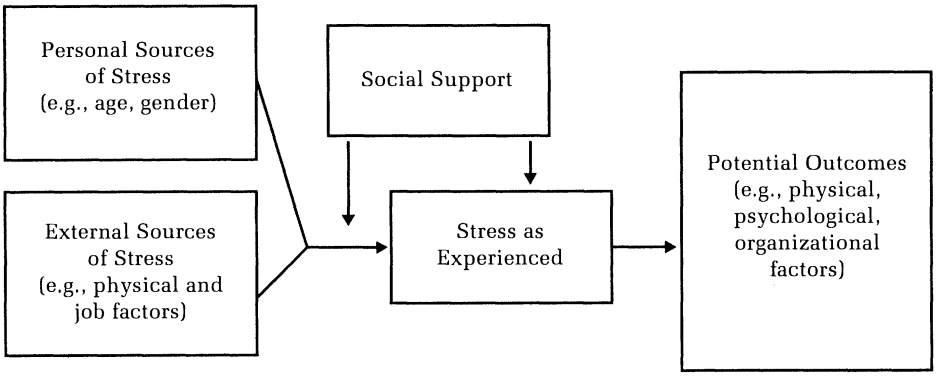
FIGURE 1
A Simplified Model of Work Stress[a]



[a]Adapted from Matteson and Ivancevich (1982).

though a lack of social support may influence the experience of stress, the provision of social support may also serve to moderate the stress-strain relationship. That is, having social support may to some extent protect individuals from the negative health effects of stress (LaRocco, House, & French, 1980; Vitkovic & Koslow, 1994).

Although many studies have investigated this model's general line of reasoning, common methods variance is a potential alternative explanation for the reported relationships between stress and health. Over 200 of the previously conducted research studies rely on self-reported perceptions of both stress and health. In addition, the majority of the health measures employed are limited to perceptions of mental health, rather than physical health. Even for those studies that did measure physical health, many researchers again employed self-report checklists of health symptoms (e.g., Karasek & Theorell, 1990). Exceptions to this approach include the Scandinavian research (e.g., Johansson, Aronsson, & Lindstrom, 1978) that has employed objective measures of both work characteristics and physiological outcomes such as neuroendocrine activation levels. Further investigation of the physical effects of stress could lead to a more complete understanding of its health impact.

The purpose of the present investigation was to avoid the limitations of past research in exploring the relationship between work stress and illness. We measured illness with the economic variable of health care costs obtained from archival medical records. These costs may reflect individual health and illness. No previous studies have predicted health care cost data from work stress measures. Empirical documentation of the health care costs and occupational stress relationship may clarify work-health connections.

STRESS AND HEALTH CARE COSTS

Health care consumed 13.2 percent of the U.S. gross national product (GNP) in 1991, up from 9.6 percent in 1981 (U.S. Department of Commerce, 1993: 413). It is estimated that health care will rise to 16 percent of GNP by the year 2000. In reference to the model presented in Figure 1 and in light of the stress literature, work *stressors* may directly and indirectly influence health outcomes, or *strains.* These strains may translate into health care costs if people seek professional treatment to deal with them.

Gibson (1993) documented that 90 percent of medical patients have stress-related symptoms or disorders. He also suggested that health care utilization resulting from stress costs U.S. industries $68 billion annually and reduces their profits by 10 percent. These estimates, even if approximate, clearly warrant a greater understanding of stress effects on health care costs. In the present study, we investigated three of the more prominent categories of stress-related variables with respect to health care costs: (1) work events—perceptions of an account of specific things that happen in the workplace that may prove to be stressful, (2) subjective perceptions of strain, and (3) social support. Health care costs are divided into these five categories of health care service: doctor's office costs, inpatient hospital costs, outpatient hospital costs, costs of prescription drugs, and other, miscellaneous costs (e.g., laboratory tests, ambulatory services, home health care, etc.).

The general hypotheses tested were,

Hypothesis 1: The magnitude of stressors is positively related to health care costs.

Hypothesis 2: The magnitude of strains is positively related to health care costs.

Hypothesis 3: The number of social supports available to individuals and their satisfaction with them are negatively related to health care costs.

Because the personal variables of age, gender, and previous health care costs may play a role in individuals' experience of stress and strain, we controlled for them in the analyses prior to examining the relationships of interest. Interaction effects on health care costs are also investigated because research (Fox, Dwyer, & Ganster, 1993) has suggested that interactions can contribute to the variance explained in stress reactions. Specific hypotheses are not proposed here concerning the relationships between particular stress variables and types of health care costs. This is because of the largely exploratory nature of this research, given that other studies have not addressed the relationship between stress and health care costs.

METHODS

Participants and Procedures

The respondents were recruited from a small manufacturing division of a large multinational chemical corporation and a large health insurance

company. Participation was voluntary and was solicited as part of a larger research project that evaluated the effectiveness of health promotion programs in work settings. Self-report variables were obtained from a survey administered at the job sites during working hours. Respondents were asked to consider, in general terms, their experiences with the stressors, strains, and social support.

Health care cost data were obtained for each employee directly from archival records held by the health insurer. These cost data were gathered for the 12 months prior to the survey administration and the 12 months afterward. We used this time period for two reasons: (1) a period of this length might be adequate for health manifestations of stress to appear and (2) these were the times at which the organizations would permit us to collect data. Because it is unclear how long potential health manifestations of stress might take, this period of time is an estimate.

Approximately 60 percent of the employees in these firms who were covered throughout the study period by traditional health care policies participated in the study. This percentage included 260 people at all hierarchical levels of the two organizations. There were 143 individuals from the health insurance company and 117 individuals from the manufacturing company. Of these respondents, 128 were managers and 132 were individuals with no supervisory responsibility. Their mean age was 36.88 years (ranging from 21 to 64, s.d. = 9.90). For the health insurance firm, 38 of the respondents were men and 105 were women (coded man = 1, woman = 2). The manufacturing company provided 47 men and 70 women.

Respondents were assured of confidentiality in release forms that they all signed. The form also allowed access to their personal health care claim data. Questionnaires were identified with social security numbers, and these were used to coordinate the health care claim data.

Measures

Social support. Social support was measured with the Social Support Questionnaire (SSQ) developed by Sarason, Levine, Basham, and Sarason (1983). The SSQ yields two scores for (1) perceived number of social supports and (2) satisfaction with the social support that is available. Internal consistency estimates for these two scales were .93 and .91, respectively.

Stressful work events. Stressful work events were assessed using the Organizational Readjustment Rating Scale (Naismith, 1975). Respondents indicated which of 30 stressful job events had occurred in the previous 12 months. Following scoring procedures similar to those used by Weiss, Ilgen, and Sharbaugh (1982), we computed a stressful work events score by summing the number of events checked.

Strain composite index. This measure was a combination of scores on the following measures: job-related tensions, job satisfaction (reversed), and negative affect. The composite was created because (1) these measures are conceptually related in that they all measure different potential aspects of

strain and (2) their scores evidenced high intercorrelations on the basis of a factor analysis.

The Job-Related Tension Index (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964) consists of 18 items rated on a seven-point scale (1 = never to 7 = nearly all the time). Job satisfaction was measured by having respondents rate ten items on a seven-point scale (1 = dissatisfied to 7 = satisfied; Manring, 1979). The items are representative of specific aspects of jobs, such as the nature of the task, the quality of supervision, relations with people, and freedom to use personal judgment and initiative. The negative affect scale from the Affect Rating Scale (Sipprelle, Gilbert, & Ascough, 1976) was used to measure this construct. This scale consists of eight items anchored on a seven-point rating scale (1 = not at all to 7 = very much). Respondents were asked to determine how well eight words (e.g., fearful, angry, bitter) described their general feelings.

The factor analysis resulted in all three variables loading on one factor that accounted for 70.17 percent of the total variance with an eigenvalue of 2.10. Thus, we computed a job strain composite index by summing the standardized scores for the three variables. The reliability estimate for this index was .78.

Health care costs. Health care costs were determined by actual dollar costs associated with all episodes pertaining to health care claims over the two-year period of the study. The cost data were obtained from insurance records that included all forms of health care typically covered by health insurance programs. Costs were available for the five categories noted earlier: physician office visit costs, hospital outpatient costs, hospital inpatient costs, prescription drug costs, and other, miscellaneous health care costs. Because the categories of health care costs were not normally distributed, we logarithmically transformed these data to attempt to normalize them.

The health care plan for each organization involved 100 percent coverage. Either a patient or a treating physician could submit claims to the insurer. Employees could use any physician they chose.

Evidence (Hafner-Eaton, 1993) suggests that well and chronically ill individuals with health insurance are twice as likely to see a physician for preventive and remedial procedures as those without insurance. Thus, because they were insured, those participating in the present study might have been expected to seek professional care for health problems that arise.

RESULTS

Zero-Order Correlations

Table 1 displays the correlations among the self-report work stress variables and the time 2 costs of health care. As expected, there was some correlation among these measures. However, the magnitude of the observed correlations suggests that these variables are not simply redundant measures and have a good deal of variance not held in common. Many of the measures

TABLE 1
Correlations among Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Gender										
2. Age	−.04									
3. Number of social supports	−.05	−.15**								
4. Satisfaction with social support	.09	−.02	.15*							
5. Stressful work events	−.01	−.19**	.02	−.11*						
6. Strain index	.14**	−.23**	−.09	.34**	.35**					
7. Doctor's office costs	−.05	−.05	−.06	−.07	.14**	.09*				
8. Inpatient hospital costs	.08	−.01	−.01	.02	.08	.06	.24**			
9. Outpatient hospital costs	.08	−.13*	−.10*	−.04	.18**	.16**	.50**	.59**		
10. Prescription drug costs[a]	.08	.15*	−.13*	−.03	−.01	−.01	.39**	.17*	.36**	
11. Other costs	.07	−.07	−.11*	−.09*	.10*	−.19**	.41**	.26**	.46**	.19*

[a] Computed for health insurance company only (n = 143).
* $p < .05$
** $p < .01$

of health care costs correlate with stressful work events, the strain index, the number of and satisfaction with social supports, and age.

Hierarchical Regression Analyses

We conducted hierarchical regression analyses to investigate the effects of the independent variables and their interactions on each of the dependent variables. On the first step of each analysis, a set of control variables was entered, which included a measure of the health care costs at time 1, age, and gender. The second set of variables entered concerned the main effects of number of social supports, stressful work events, and the strain index. The third set concerned interactions between each of the independent variables and the number of and satisfaction with social supports.

Table 2 displays the regression results. The equation for the dependent variable of prescription drug costs was computed for only the health insurance company, because the drug cost data were not available for respondents from the manufacturing organization. The total R^2 was statistically significant for the dependent variables of doctor's office costs ($F_{18,241} = 5.25$, $p < .01$), hospital outpatient costs ($F_{18,241} = 3.44$, $p < .01$), and prescription drug costs ($F_{18,241} = 2.69$, $p < .01$). The increment to R^2 was statistically significant for the addition of the main effects on the dependent variables of hospital outpatient costs ($\Delta R^2 = .032$, $F_{4,251} = 2.41$, $p < .05$) and other costs ($\Delta R^2 = .037$, $F_{4,251} = 2.52$, $p < .05$).

The increment to R^2 from step 2 to step 3 was also significant for the addition of the interaction terms in the cases of doctor's office costs ($\Delta R^2 = .056$, $F_{11,240} = 1.88$, $p < .05$) and prescription drug costs ($\Delta R^2 = .078$, $F_{11,123} = 2.62$, $p < .01$).

Some regression weights were marginally significant ($p < .10$) for the doctor's office costs equation. Although these results do not achieve traditional levels of significance ($p < .05$), we considered it important to identify these marginal results because of the exploratory nature of this study as well as the actual dollar amounts that are associated with health care use. Those regression weights that are part of a step that makes a significant contribution to R^2 are examined.

These marginally significant main effects on doctor's office costs included work events and stressors, which both had positive relationships. Thus, weak support for the second and third hypotheses emerged. Stress and strain appear to be positively related to health care costs. Also, for the dependent variable of doctor's office costs, the following interaction terms were marginally significant (at $p < .10$): (1) number of social supports times gender, (2) satisfaction with social support times work events, and (3) number of social supports times strain. Number of social supports appears to be negatively related to doctor's office costs, and this relationship is more pronounced for men than for women.

For the second interaction, doctor's office costs are relatively unaffected by social support for those experiencing low levels of strain. But these costs

are considerably lower for those experiencing high strain levels under conditions of high social support as opposed to low social support.

The interaction between satisfaction with social support and stressful work events suggested that those with low social support appeared to have greater doctor's office costs when exposed to stressful work events than those with high social support who were similarly exposed. These costs were similar for those with high social support regardless of the level of work events.

Concerning the dependent variable of prescription drug costs, the regression weight for the main effect of strain was marginally significant ($p < .10$) and positive, suggesting that as the stressors increase, so do the costs. Also marginally significant ($p < .10$) was the interaction term for satisfaction with social support times prescription drug costs at time 1. Those with low satisfaction with social support tended to have slightly higher prescription drug costs at time 2, regardless of the level of drug costs at time 1.

DISCUSSION

Even though this study was exploratory, results suggest that individual medical responses are related to job stress. After controlling for time 1 health care costs as well as age and gender, we found that main effects of stress and social support and their interaction accounted for 9 percent of the variance in prescription drugs, 7.8 percent of the variance in both doctor's office costs and other costs, and 7 percent of the variance in hospital outpatient costs. The fact that direct dollar costs are associated with these health care expenses underscores the importance of these findings.

These results appear to be consistent with the psychosomatic literature (e.g., Holmes & Rahe, 1967). This perspective posits that a concentrated experience of stressful life events and resulting strain will be related to (and likely result in) the onset of disease and illness. When too much adaptive energy is required of an individual in a given time frame, the individual's immune system breaks down and disease is imminent. Extending this logic, individuals who have more illnesses should tend to incur more health care costs.

Stressful events have been deemed important in the job stress literature for some time now. Numerous studies have reported relationships between stressful work events and outcomes such as perceived stress and strain (Koch, Tung, Gmelch, & Swent, 1982; Naismith, 1975), lowered performance (Motowidlo, Packard, & Manning, 1986), and absenteeism (Manning & Osland, 1989). The findings of the current study extend the stressful work events literature to the economic costs of health care claims.

In the present study, the hypotheses concerning the relationship between stress, strain, and health care costs were supported for the dependent variable of doctor's office costs. Furthermore, the strain-health care cost hypothesis was supported for prescription drug costs. Although the hypothesized social support main effects were not supported, we found interactions. These concern the effect of social support in conjunction with stressors in affecting

TABLE 2
Results of Hierarchical Regression Analyses

Independent Variables	Health Care Cost Dependent Variables, Time 2														
	Doctor's Office			Hospital Inpatient			Hospital Outpatient			Prescription Drug[a]			Other Costs		
	b	R^2	ΔR^2	*b*	R^2	ΔR^2	*b*	R^2	ΔR^2	*b*	R^2	ΔR^2	*b*	R^2	ΔR^2
Step 1															
Dependent variable, time 1	0.13			0.13			−0.30			−0.77			−0.24		
Age	0.14			0.02			−0.13			−0.02			−0.14		
Gender	−3.07	.209**		1.63	.014		3.77	.134**		1.55	.191**		2.07	.026†	
Step 2															
Satisfaction with social support	−0.14			0.52			0.78			0.96			−0.12		
Number of social supports	0.20			0.04			0.31			0.48			−0.29		
Work events	0.35†			−0.16			0.02			0.22			0.13		
Strain	0.74†	.226**	.017	0.01	.021	.007	0.44	.166**	.032*	0.69†	.203**	.012	0.33	.063*	.037*
Step 3															
Number of social supports × satisfaction with social support	−0.15			−0.04			−0.13			−0.09			0.02		
Number of social supports × work events	0.01			0.01			0.02†			−0.01			−0.01		
Number of social supports × strain	−0.04†			−0.02			−0.04			−0.03			0.01		
Number of social supports × gender	0.21†			0.03			0.09			0.13			−0.01		

TABLE 2 (continued)

Independent Variables	Health Care Cost Dependent Variables, Time 2														
	Doctor's Office			Hospital Inpatient			Hospital Outpatient			Prescription Drug[a]			Other Costs		
	b	R^2	ΔR^2	*b*	R^2	ΔR^2	*b*	R^2	ΔR^2	*b*	R^2	ΔR^2	*b*	R^2	ΔR^2
Number of social supports × age	0.01			0.01			0.01			−0.01			0.01		
Satisfaction with social support × work events	−0.07†			0.03			0.01			0.04			−0.02		
Satisfaction with social support × strain	−0.10			0.02			0.12			−0.10			−0.06		
Satisfaction with social support × gender	0.33			−0.28			−0.72			−0.36			−0.36		
Satisfaction with social support × age	0.02			−0.01			0.02			0.01			0.02		
Number of social supports × dependent variable, time 1	0.01			−0.03			−0.01			−0.01			0.04		
Satisfaction with social support × dependent variable, time 1	0.07	.282**	.056*	0.02	.044	.023	0.12	.204**	.038	0.24†	.281**	.078**	0.04	.104†	.041

[a] Computed for health insurance company only (n = 143).

† $p < .10$
* $p < .05$
** $p < .01$

health outcomes. In general, higher social support tends to be associated with lower health care costs. These relationships were more pronounced for men and for those experiencing high stress and strain levels. The gender effect is consistent with previous research suggesting that men and women may use support differently (Fusilier, Ganster, & Mayes, 1986).

Interestingly, high strain accompanied by high social support was associated with a much lower level of costs than was apparent under the low strain condition. This finding suggests that some stress, if coupled with social support, may result in a healthy level of arousal. Medical attention thus may not be sought for the effects of positive stress. Social support may be key to the individual's interpretation of these strains as "eustress" rather than distress.

The marginally significant ($p < .10$) interaction between satisfaction with social support and work events suggests that high social support tends to neutralize the effect of stress on doctor's office costs. That is, under conditions of high social support, costs are only slightly higher for the group with a high number of stressful work events than for the group with a low number of such events. When social support was low, however, those experiencing a high number of stressful work events tended to have higher costs than those with low levels of work events. Thus, the findings are generally consistent with previous literature reporting that social support tends to mute the detrimental effects of stress on health.

Given this evidence that work stress is related to the costs of health care (or illness), it seems important that further research clarify this relationship. Two possible strategies that might allow future research to reach stronger conclusions are the following: (1) Greater control over stressors could be implemented. Experimental manipulation of such a variable, however, would raise significant ethical questions about the treatment of human subjects. (2) A better alternative might be use of longitudinal studies employing repeated measures. Such studies, which would allow researchers to have statistical control as well as the ability to assess cause and effect, would likely substantially extend the present exploratory results.

One important limitation of this study was its measurement of stressors as discrete events only, without accounting for the impact of chronic exposures such as work overload or lack of control. In addition, the measurement of job stressors employed represents a very general approach, likely missing job events that are unique to the occupations studied. The effect of these limitations may be a conservative estimate of the true relationship between occupational stress and health care costs. Future research could consider these limitations.

The primary contribution of the present study is the evidence for the connection between stress and health care costs. Given the magnitude of these costs for most organizations, identification of any contributing factor may be useful in a firm's strategic attempts to maintain cost competitiveness. In addition, a greater understanding of the stress and health care cost relationship should help reveal how to enhance the physical well-being and health of individuals in organizational settings.

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