

JOB DISSATISFACTION AS A POSSIBLE RISK FACTOR IN CORONARY HEART DISEASE*

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IN RECENT years, various investigations have attempted to elucidate the relationship between social status and risk of death due to coronary heart disease. In general, the data presented in these studies have shown no consistent pattern. In some investigations [1-6] a positive relationship has been reported between status and coronary disease. In other studies [7-10] a negative relationship has been noted between these variables. In still other investigations a curvilinear relationship—either U-shaped [11-13] or inverted-U-shaped [14]—has been observed. In further studies [15-17] a lack of any appreciable relationship has been reported. This variety of results has surely contributed to the general impression held by writers of review articles [18-19] that social status and coronary disease are essentially unrelated in the population at large.

The present authors, like many others, believe that the social environment can exert an important influence upon an individual's risk of coronary disease. However, we do not feel that social status *per se* plays this role. Rather, we believe that social factors which may be associated with status exert such influence. In an earlier paper [20], the senior author suggested that particular forms of social stress may contribute to heightened risk of coronary disease. In the present report, we shall attempt to demonstrate that an individual's dissatisfaction with his job has similar etiologic implications.

We shall describe here three separate investigations designed to test this general hypothesis. Each of these studies involves a different set of subjects and slightly different methods; however, the general procedure is similar from study to study. In each investigation, we select various occupational groups for whom (a) mortality ratios due to coronary heart disease and (b) average levels of job satisfaction are known. We then relate these two variables to each other. The design of these studies

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is thus similar to that used in most 'ecological' epidemiologic investigations, although the putative causal factor studied here (job dissatisfaction) is hardly a conventional epidemiologic variable.

STUDY I

Methods

The first study reported here involves data on 16 different occupational groups; the groups used are shown in the first column of Table 1. The overall level of job satisfaction within each of these groups has been estimated from the per cent of individuals within each group who respond "yes" to questionnaire items such as, "If you had your life to live over, would you like to wind up in the same line of work as the one you're doing now?" and (for scholars), "If you had it to do over again, would you choose the same line of study?" These job satisfaction data have not been collected by the present authors; rather, the figures involved represent the end products of 3 previously-published investigations [21-23].

TABLE 1. OCCUPATIONAL GROUPS USED IN STUDY I

Groups for whom job satisfaction data are available	Apparently equivalent census groups
<i>Blue collar</i>	
Farmers	Farmers and farm laborers
Skilled printers	Printing craftsmen, except compositors and typesetters
Skilled steelworkers	Operatives and kindred workers, not elsewhere classified (n.e.c.), primary metal industries
Textile workers	Laborers (n.e.c.), textile mill products and apparel
Unskilled steelworkers	Laborers (n.e.c.), primary metal industries
Unskilled automobile workers	Laborers (n.e.c.) transportation equipment
Skilled automobile workers	Operatives and kindred workers (n.e.c.), motor vehicles
Paper workers	Operatives and kindred workers (n.e.c.), paper and allied products
<i>White collar</i>	
Urban university professors	College presidents, professors, and instructors (n.e.c.)
Biologists	Natural scientists (n.e.c.)
Physicists	Natural scientists (n.e.c.)
Chemists	Chemists
Lawyers, firm and solo	Lawyers and judges
Managers	Managers, officials and proprietors, except farm
Sales	Sales workers
Clerical	Clerical and kindred workers

The first of these studies was performed in the late 1940's by the Roper organization. It involved (a) random samples of 3 scientific groups (biologists, chemists, and physicists), with an overall N of 4000, and (b) a nation-wide sample of 3000 working-class males. The data reported here have been taken from Blauner's [21] secondary analysis of these data. Unfortunately, Blauner failed to report the number of subjects in each of the 11 groups (3 scientific, 8 working-class) which he analyzed. However, considering the overall size of the sample, one may reasonably assume these N 's to be acceptably large.

The second study [22] involved probability samples of lawyers and university professors in the Detroit area during the 1950's. This study surveyed 207 lawyers and 68 professors. The third study [23], also performed in the 1950's, used a national cross-section of working men including 127 managers or proprietors, 55 sales workers, and 46 clerical employees.

For each of the occupational groups in these 3 studies, an apparently equivalent census classification was chosen. These apparently equivalent census groups are shown in the second column of Table 1. The standardized mortality ratio (SMR)* of men aged 25-59 yr in these groups due to arteriosclerotic heart disease, including coronary disease (rubric 420) in 1950 has been published by the Department of Health, Education, and Welfare [24]. These mortality ratios constitute the measure of coronary disease used in this study. Finally, because of the interest which has traditionally been attached to this variable, a measure of each group's socioeconomic status was established. The status measure employed was the Duncan socioeconomic index [25], an index which is widely used in sociologic research. The data used in Study I are presented in Table 2.

TABLE 2. DATA USED IN STUDY I

Occupational group	Per cent satisfied	Coronary disease SMR	Status
Farmers*	84	66	14
Skilled printers*	52	110	49
Skilled steelworkers*	41	85	15
Textile workers*	31	120	03
Unskilled steelworkers*	21	125	04
Unskilled automobile workers*	16	176	13
Skilled automobile workers*	41	68	21
Paper workers*	42	73	19
University professors†	93	71	84
Biologists*	89	69	80
Physicists*	89	69	80
Chemists*	86	100	79
Lawyers†	80	124	93
Managers‡	69	116	79
Sales‡	52	126	50
Clerical‡	42	103	44

* Data provided by Blauner [21].

† Data provided by Wilensky [22].

‡ Data provided by Gurin, Veroff and Feld [23].

Product-moment correlations are the primary statistical tool used in Study I. These correlations are calculated separately within the blue-collar and white-collar classifications, since earlier research [reviewed in 21, 23, and 26] has shown these broad groups to be non-comparable with regard to job satisfaction.

*The SMR is defined [24] as the tabulated deaths for an occupation-cause group divided by the expected deaths for this occupation-cause group and multiplied by 100. The SMR is standardized for age.

Findings

In the present data, there is no particular indication that social status is related to coronary disease mortality. The correlation between status (as measured by the Duncan index) and the SMR for coronary disease is -0.288 for the white-collar groups and -0.170 for the blue-collar groups. Neither of these correlations is statistically significant. In addition, the white-collar groups do not differ from the blue-collar groups in their average mortality ratios. The mean SMR for the white-collar groups is 97 and that for the blue-collar groups is 103.

On the other hand, the data indicate a strong relationship between job satisfaction and coronary disease. For the white-collar groups, a correlation of -0.630 , $p < 0.05^*$, was observed between job satisfaction and coronary disease. The parallel correlation for the blue-collar groups was -0.716 , $p < 0.05$. These correlations are reasonably large and are congruent with the hypothesis which guides this investigation; as expected, high levels of job satisfaction do tend to be associated with low rates of death from coronary disease.

However, this conclusion is somewhat clouded by the presence of large positive correlations between social status and job satisfaction in both blue- and white-collar groups. For the 8 white-collar groups, this relationship was found to be 0.881, $p < 0.001$; for the 8 blue-collar groups, the same correlation was found to be 0.344 (not significant). These correlations are congruent with previous findings [reviewed in 27], and they raise an important question regarding the unique variance, if any, which is contributed by job satisfaction *per se* to a group's death rate from coronary disease. In an attempt to answer this question, partial correlations were computed between coronary disease death rates and job satisfaction, with the effects of social status held constant by means of the statistical procedure. These partial correlations were found to be -0.830 for the white-collar groups and -0.744 for the blue-collar groups; both are significant beyond the 0.05 level. These data suggest that, regardless of a group's social status, its average level of job satisfaction will be strongly (and negatively) related to its rate of coronary disease.

Discussion

It should be clear that Study I involves a number of important methodologic ambiguities. The independent variable used here is measured by a single question, and single-question measures are highly unreliable [28]. Further, and perhaps more important, the specific question used differed slightly from occupational group to occupational group. In addition, the subject samples for the 16 groups used here are sometimes not random national samples of the groups involved, and the groups themselves are certainly not random representatives of occupational groupings in the United States. Finally, there is no guarantee that the occupational groups for whom job satisfaction data are available (e.g. skilled steelworkers) fully correspond to the census classifications (e.g. operatives and kindred workers, not elsewhere classified, primary metal industries) on which the coronary disease mortality data are based. Nevertheless, and with these problems taken into consideration, the data presented here do seem to indicate that job satisfaction is negatively related to coronary disease mortality.

*Since the direction of all correlations reported in this paper has been predicted in advance, one-tailed significance tests have been employed throughout.

STUDY II

Study II attempts to avoid some of the methodologic ambiguities which were present in Study I. This second study employs as a measure of job satisfaction not only a single question, but also a set of questions involving 6 different aspects of job satisfaction. These questions were asked in an identical form to subjects in all of the groups used here, so there is no possibility that error due to variations in question wording could have influenced the data. Finally, the data are based on a set of occupational groups which differs substantially from the set used in Study I. Of the 12 groups for which these new job satisfaction data are available, only 3 appeared in the previous investigation. This last consideration permits us not only to confirm, but also to extend the generality of the findings drawn from Study I.

Methods

Study II involves data gathered from a national sample of nonagriculturally employed men and from a similar sample of man in the Jackson, Michigan area [29]. These data were collected during the mid-1960's, and they provide usable information for 12 occupational groups. The groups used in Study II are listed in the first column of Table 3; all of these involve white-collar jobs.

TABLE 3. OCCUPATIONAL GROUPS USED IN STUDY II

Groups for whom job satisfaction data are available	Apparently equivalent census groups
Professors, librarians	College presidents, professors, and instructors (not elsewhere classified)
Advising professions	Social, welfare, and recreation workers
School teachers	Teachers (n.e.c.)
Scientists, physicians	Physicians and surgeons
Accountants, auditors	Accountants and auditors
Engineers	Other technical engineers
Technicians	Other professional, technical, and kindred workers
Managerial (salaried and self-employed combined)	Managers, officials, and proprietors, except farm
Bookkeepers	Bookkeepers
Other clerical	Other clerical and kindred workers
Sales (goods, services, and sales clerks combined)	Sales workers
Other sales	Other specified sales workers

The average job satisfaction for each of these groups in terms of (a) an overall measure of satisfaction and (b) specific indices of intrinsic and extrinsic satisfaction have been reported by Robinson [29]. The overall measure was the per cent of individuals within each group who responded 'no' to the single question, 'Do you ever think of changing to another job or another type of work?' Intrinsic satisfaction was measured by the average of the respondents' satisfaction with their 'chance to use your skills or abilities' and their 'chance to learn or try out new things', while extrinsic satisfaction was measured by the subjects' satisfaction with their pay, job security, kind of work place, and co-workers. Four-point scales, from "very good" to "poor", were employed for the intrinsic and extrinsic satisfaction items.

For each of the 12 occupational groups used here, an apparently equivalent census classification was chosen. These apparently equivalent groups are shown in the second column of Table 3. As in Study I, the standard mortality ratios in 1950 of men aged 25–59 in each of these groups for rubric 420 has been taken from the tables published by the Department of Health, Education, and Welfare [24]. Further, as in Study I, the Duncan socioeconomic index [25] for each of these groups has previously been established. The data used in Study II, and the *N*'s involved in each of the 12 occupational samples, are presented in Table 4.

TABLE 4. DATA USED IN STUDY II

Occupational group	<i>N</i>	Per cent satisfied	\bar{X} Intrinsic satisfaction	\bar{X} Extrinsic satisfaction	Coronary disease SMR	Status
Professors, librarians	8	75	1.44	1.80	71	84
Advising professions	36	69	1.32	1.67	79	66
School teachers	54	74	1.32	1.98	75	72
Scientists, physicians	16	62	1.56	1.64	131	92
Accountants, auditors	13	46	1.66	1.84	133	78
Engineers	43	44	1.76	1.74	89	87
Technicians	33	39	1.94	2.15	119	62
Managerial	131	65	1.67	1.81	116	62
Bookkeepers	18	78	1.81	2.21	103	51
Other clerical	150	58	2.62	2.02	105	44
Sales	50	38	2.02	2.13	126	50
Other sales workers	7	58	2.22	2.38	136	50

Note—The data for intrinsic and extrinsic satisfaction are coded such that a low score implies high satisfaction. All data are provided by Robinson [29].

Findings

As in Study I, Study II revealed no particular relationship between social status and coronary disease. The correlation in question was -0.245 , not significant.

However, a significant negative correlation ($r = -0.547$, $p < 0.05$) was observed between the groups' total job satisfaction (as measured by the 'Do you ever think of changing to another job' question) and their rates of coronary heart disease. This finding is a substantial replication of the major finding reported in Study I, and it is clearly in line with the hypothesis which informs this report. Unlike Study I, however, the meaning of this relationship is not clouded by a strong correlation between status and overall job satisfaction; in the current investigation, this correlation was found to be only 0.050 (not significant).

In addition, the data from Study II suggest that the relationship between job satisfaction and coronary disease may be slightly stronger for intrinsic satisfactions than for extrinsic satisfactions. The correlation between the index of intrinsic satisfaction and the groups' mortality ratios from coronary disease is -0.488 ($p < 0.10$), while the parallel correlation between the index of extrinsic satisfaction and rate of death from coronary disease is less (-0.355) and not significant. These findings are not markedly altered by the statistical removal of the effects of social status from the correlations involved. The partial correlation between intrinsic job satisfaction and coronary disease (with social status removed from the relationship) is -0.454

($p < 0.10$); the parallel partial correlation between extrinsic job satisfaction and coronary disease is -0.268 (not significant). However, the difference between intrinsic satisfaction and extrinsic satisfaction as correlates of coronary disease is not statistically reliable. Further, the two forms of satisfaction correlate quite highly with each other ($r=0.609$, $p < 0.05$), so it is reasonable that they should exhibit similar relationships with other variables.

Discussion

In general, the findings from Study II appear to support those obtained in Study I. In both investigations, large significant negative correlations were observed between indices of job satisfaction and the coronary disease mortality ratios of the groups involved. The fact that Study II corroborates Study I in spite of differences between the two studies in (a) occupational groups used, (b) sample studied, and (c) job satisfaction measures employed adds substantial strength to this conclusion.

STUDY III

A major methodologic problem of Studies I and II has been the fact that the groups for which job satisfaction data are available are only *apparently* equivalent to the groups for which coronary disease rates have been established. There is no reason why these original data, having been collected for other purposes, should have been made compatible with the census categories. However, from the point of view of the present investigation, it would be preferable to base our conclusions on strictly comparable occupational categories. Study III is directed toward this goal.

For Study III, we have utilized one of the largest files of job satisfaction data currently available in the United States. These data, collected during the early 1960's by P. C. Smith and her associates, have been gathered from employees in 21 different organizations. These represent an extremely broad range of environments. Within each of these 21 organizations, a stratified sample of approximately 100 employees was selected. Each of these subjects responded to a 'job description' questionnaire (e.g. 'My job is boring') designed to measure 5 varieties of satisfaction (one of them intrinsic and four of them extrinsic). Dr. Smith has generously allowed us to use these data as the basis of Study III.

For the purposes of this study, we coded the occupational title of each of the original subjects in Smith's investigation into the census categories. This establishes absolute comparability between the classifications on which job satisfaction data are available and those for which coronary disease death rates are known. We then computed average total satisfaction and also average intrinsic and extrinsic satisfaction (a) for all white-collar groups involving 8 or more subjects and (b) for all blue-collar groups involving 20 or more subjects. (As one would expect, the sample included far more blue-collar than white-collar employees, and the selection rules are an attempt to provide the largest possible number of blue- and white-collar occupational categories for which a reasonably stable estimate of job satisfaction is available.) This procedure yielded a total of 13 white-collar and 23 blue-collar groups. These groups, identified according to the census categories used, are presented in Table 5. Only 6 of the 36 groups involved have appeared in either Study I or Study II.

As in Studies I and II, the present investigation also employs these groups' SMR's from coronary disease and their socioeconomic statuses (as established on the Duncan

index) in the analysis. The raw data used in this investigation, and the number of subjects in each of the 36 groups involved, are presented in Table 6 and 7.

Findings

The present data, like those available in Studies I and II, show no pronounced relationship between social status and coronary disease. For white-collar groups the correlation between these variables is -0.427 ; for blue-collar groups the parallel correlation is -0.119 . Neither of these correlations is statistically significant. In addition, there is no particular difference between the average SMR of the white-collar groups and that of the blue-collar groups. The average SMR within the white-collar category is 107 while the parallel figure within the blue-collar category is 100.

TABLE 5. OCCUPATIONAL GROUPS USED IN STUDY III

White-collar groups	Blue-collar groups
Accountants and auditors	Electricians
Chemists	Foremen (n.e.c.), manufacturing, durable goods
Draftsmen and designers	Foremen (n.e.c.), manufacturing, non-durable goods
Electrical engineers	Foremen (n.e.c.), nonmanufacturing industries
Engineers, not elsewhere classified (n.e.c.)	Machinists and job setters
Natural scientists	Molders, metal
Other professional, technical and kindred workers	Toolmakers, and die makers and setters
Managers, officials and proprietors (n.e.c.) manufacturing	Other craftsmen and kindred workers
Managers, officials, and proprietors (n.e.c.), wholesale and retail trade	Filers, grinders and polishers, metal
Managers, officials, and proprietors (n.e.c.), other industries	Truck drivers and deliverymen
Bookkeepers	Welders and flame-cutters
Other clerical and kindred workers	Operatives and kindred workers (n.e.c.), stone, clay, and glass products
Salesmen and sales clerks (n.e.c.), retail trade	Operatives and kindred workers (n.e.c.), fabricated metal industries
	Operatives and kindred workers (n.e.c.), machinery, except electrical
	Operatives and kindred workers (n.e.c.), electrical machinery, equipment and supplies
	Operatives and kindred workers (n.e.c.), transportation equipment, except motor vehicle
	Operatives and kindred workers (n.e.c.), other durable goods
	Operatives and kindred workers (n.e.c.), yarn, thread, and fabric mills
	Operatives and kindred workers (n.e.c.), chemicals and allied products
	Other specified operatives and kindred workers
	Janitors and porters
	Laborers (n.e.c.), machinery, including electrical
	Laborers (n.e.c.), other non-durable goods

However, quite large negative correlations were observed for the white-collar groups between coronary disease and total satisfaction ($r = -0.635$, $p < 0.01$), intrinsic satisfaction ($r = -0.677$, $p < 0.005$), and extrinsic satisfaction ($r = -0.624$, $p < 0.01$). The

statistical removal of the effects of social status does not materially alter these relationships. The partial correlations between job satisfaction and coronary disease mortality are -0.528 (total satisfaction), -0.591 (intrinsic satisfaction), and -0.512 (extrinsic satisfaction). All are significant beyond the 0.05 level.

TABLE 6. DATA USED IN STUDY III, WHITE-COLLAR GROUPS

Occupational group	N	\bar{X} Total satisfaction	\bar{X} Intrinsic satisfaction	\bar{X} Extrinsic satisfaction	Coronary disease SMR	Status
Accountants, auditors	22	30.03	38.05	28.02	133	78
Chemists	23	33.90	41.35	32.04	100	79
Designers, draftsmen	22	31.89	41.00	29.61	114	70
Electrical engineers	8	36.02	44.62	34.62	83	84
Other engineers	96	33.16	42.44	30.84	89	87
Natural scientists	9	35.55	43.44	33.58	69	80
Other professional workers	61	33.99	40.80	32.29	119	65
Managers, manufacturing	98	35.53	43.11	33.64	111	79
Managers, wholesale and retail	15	33.15	41.33	31.11	126	70
Managers, other	49	35.21	42.83	33.30	105	62
Bookkeepers	12	33.53	42.92	31.18	103	51
Other clerical workers	359	30.00	37.83	28.04	105	44
Salesmen and sales clerks	25	29.71	39.24	27.33	130	39

It may be noted that, as in Study II, intrinsic satisfactions show a slightly higher correlation with coronary disease mortality than is shown by extrinsic satisfactions. However, also as in Study II, the difference between these correlations is not statistically reliable. This lack of a reliable difference seems quite reasonable, since the two forms of satisfaction are extremely highly related to each other in this sample of groups ($r=0.864$, $p < 0.001$).

This pattern is repeated, although not significantly, for the blue-collar groups. The relationship between total satisfaction and coronary disease in these groups is -0.137 ; the relationship between coronary disease and intrinsic satisfaction is -0.220 , and the relationship between coronary disease and extrinsic satisfaction is -0.087 . None of these correlations is significantly different from zero, although all of them are in the predicted direction.

Discussion

The findings derived from the white-collar groups seem to be acceptable replications of the data reported in Studies I and II. The failure of these relationships to be significantly repeated for the sample of blue-collar groups is surprising. One can speculate that this failure to replicate is due to some peculiarity in the sample of organizations chosen by the Smith group, or to the invalidity of the questionnaire involved for measuring satisfaction in blue-collar workers. These speculations are perhaps supported by the fact that, in the present data, blue-collar laborers (who have particularly high rates of coronary disease) show essentially the same degrees of job satisfaction as is shown by blue-collar operatives (who have particularly low rates of coronary disease). This is a most unusual result; other investigations [summarized in

21-23 and 26-27] have almost invariably found operatives to have substantially greater satisfaction than laborers. In any event, however, the pattern of data derived from this sample of blue-collar groups does parallel that reported in the previous studies.

TABLE 7. DATA USED UN STUDY III, BLUE-COLLAR GROUPS

Occupational group	N	\bar{X} Total satisfaction	\bar{X} Intrinsic satisfaction	\bar{X} Extrinsic satisfaction	Coronary disease SMR	Status
Electricians	21	28.61	31.10	27.99	127	44
Foremen, manufacturing, durable goods	114	33.86	41.37	31.98	92	60
Foremen, manufacturing, non-durable goods	40	34.72	42.90	32.68	99	46
Foremen, non-manufacturing	22	34.34	43.14	32.14	90	44
Machinists and job setters	77	29.02	29.17	28.98	143	33
Molders, metal	20	32.50	32.81	32.42	96	12
Tool and die makers	32	31.55	43.06	28.76	97	50
Other craftsmen	192	29.89	35.45	28.50	101	32
Filers, grinders	51	28.50	33.61	27.22	79	22
Truck drivers	36	29.76	33.00	28.93	100	15
Welders and flamecutters	46	27.08	29.38	26.51	102	24
Operatives, stone and glass	29	28.41	30.33	27.93	89	23
Operatives, fabricated metal	24	33.51	31.33	34.06	82	15
Operatives, machinery	100	27.89	33.28	26.54	71	22
Operatives, electrical	57	32.34	36.14	31.39	85	26
Operatives, transportation	47	25.49	29.15	24.58	97	23
Operatives, other durables	34	31.31	30.98	31.39	84	16
Operatives, yarn and fabric	56	26.45	28.07	26.04	113	02
Operatives, chemicals	31	29.28	33.10	28.32	59	20
Other specified operatives	306	29.00	32.99	28.00	75	18
Janitors and porters	25	29.33	30.14	29.13	83	09
Laborers, machinery	40	28.26	32.17	30.36	169	10
Laborers, other non-durables	22	30.72	30.68	27.66	176	08

OTHER DISEASES

In an attempt to determine whether the findings reported above are specific to coronary disease, analyses parallel to those performed in Studies I, II, and III were also computed for other major causes of death. These rubrics, the only ones which are reported for many of the work groups studied here, are as follows: 001-019 (tuberculosis, all forms), 140-205 (malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues), 260 (diabetes mellitus), 440-443 (hypertension with heart disease), 48-493 (influenza and pneumonia), and E800-E962 (accidents). In no case was the pattern reported above duplicated for any of these other causes of death. These findings are in accord with the hypothesis that the current results are specific to coronary disease and are not merely a function of overall mortality rates.

DISCUSSION

The data presented here provide reasonably strong support for the hypothesis that job satisfaction is negatively related to a group's rate of death from coronary heart disease. In each of 3 studies, significant negative correlations between job satisfaction and coronary disease mortality have been found; this has remained true in spite of large differences between the studies in (a) groups investigated and (b) measures employed. To be sure, each of these studies has involved important methodologic problems. However, the influence of many of these is likely to be conservative.

Naturally, the data reported here are drawn from analysis of grouped or 'ecological' data. Because of this methodologic approach, one might be tempted to maintain that the present data are irrelevant in terms of *individuals'* risk of death from coronary heart disease. It is true, of course, that these findings are relevant to individual persons only in terms of an estimate of probability. However, data supportive of the general hypothesis investigated here have also been obtained using individuals as the sampling points. In this earlier study [20], individuals were asked to perform an experimental task for 1 h. Their enjoyment of the experiment was negatively and significantly correlated with increases in their levels of serum cholesterol. Although the dependent variable used in this earlier study was not coronary disease mortality, the findings do nevertheless seem quite congruent with those presented here. In addition, this experimental result does not suffer from the limitations (e.g. non-random samples, self-selection of individuals into groups, possible spurious variables, indeterminant direction of causality) which characterize correlational studies such as those reported here. Of course, the present argument would be considerably strengthened by the discovery of a negative relationship between *individuals'* satisfaction with their organizational roles and their risk of death from coronary disease. Naturally, a prospective investigation would be ideal for testing this hypothesis.

As with other two-variable studies, the present investigations offer no assurance that the observed relationships are not due to correlations between the variables used here and some third, spurious factor. For instance, 'job stress' could cause both (a) high risk of death from coronary disease and (b) low levels of job satisfaction. This would lead to an observed correlation between satisfaction and coronary disease, even when no causal relationship between these variables existed. Such a pattern of correlations was observed in the previously-cited laboratory investigation [20]. However, the data available in that study indicated that the job stress in question could not account for the observed relationship between job satisfaction and changes in the subjects' levels of serum cholesterol. Similarly, age could account for the present findings if older workers tended to be less satisfied than younger workers. However, research [e.g. 31] appears to indicate that older workers, at least up to age 60, are considerably more satisfied than younger workers. These considerations do not demonstrate that the relationship between coronary disease and job satisfaction could not be due to some third, spurious variable. However, they at least remove some of the more obvious spurious variables from contention.

In a sense, the present hypothesis is not new to the medical literature. For instance, a recent paper [32] has indicated an etiologic relationship between status incongruence and risk of death from coronary disease; significantly, status incongruence clearly appears to be one factor which decreases individuals' job satisfaction [e.g. 33]. Furthermore, Wolf [e.g. 34] has long maintained that individuals who "strive without

joy" are those who finally succumb to coronary disease. Wolf's argument has been largely based on clinical data, with all their potential biases. However the population data presented here fully support Wolf's argument. The present authors would not, like Wolf, speak of a 'Sisyphus complex' which haunts victims of coronary disease. After all, there is no evidence that Sisyphus himself ever exhibited any of its symptoms. However, we do believe that 'striving without joy' may indeed lead to an increased risk of coronary disease—and that 'striving with joy' may reduce this risk. Further, we are excited by the possibility that changing work environments so as to raise individuals' levels of job satisfaction may thereby lower these individuals' risk of coronary disease. This possibility represents one of the ways in which social psychology can contribute to practical programs of preventive medicine.

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