

Cardiovascular Risk Factors and Life Changes

Jonathan E. Rodnick, MD, and Alan A. Frischer, MPH
San Francisco, California

Many variables are considered risk factors for cardiovascular disease. This study examines the associations among a psychological variable (type A personality measurement), a social variable (Holmes and Rahe Schedule of Recent Events), and physiologic variables (age, blood pressure, smoking, and cholesterol), as measured to fill out a health hazard appraisal. These tests and questionnaires were administered to 572 persons from the San Francisco Bay area when they enrolled in a health promotion program (Common Health Care). Recent life changes and a self-measurement of coronary prone behavior showed no significant correlations to major heart disease risk factors.

This paper reports on the interrelationship of the following three predictors of cardiovascular disease risk: a measure of coronary prone behavior, the Holmes and Rahe Schedule of Recent Events, and a health hazard appraisal. This study is part of a larger health promotion and prevention program conducted in the San Francisco Bay area by Common Health Care.

The first hypothesis of this study was that those individuals with higher recent life changes, as measured by the Holmes and Rahe Schedule of Recent Events, would have higher cardiovascular risk factors as measured by the data used to calculate a health hazard appraisal. The second hypothesis was that those individuals with higher coronary prone behavior ratings would also have higher risk factors.

The Schedule of Recent Events has been widely employed as a measure of recent stressful life events. This 43-item checklist covers common and potential stressful situations arising from family,

occupational, and financial events that usually require some period of readjustment (such as divorce, jail sentence, new mortgage, etc).¹ Byrne and Whyte² showed an association between the presence of stressful life events and the occurrence of myocardial infarction. Rahe and his colleagues^{3,4} have shown that recent life changes prior to an infarction were nearly 100 percent higher than baseline levels. Further, life change levels were over 200 percent higher during the last six months of life in patients who had fatal myocardial infarctions. Carasso⁵ showed that the severity of cerebrovascular attacks is influenced by both recent life events and the presence of type A personality.

Type A (coronary prone) behavior has been studied extensively. This personality complex has been used to describe ambitious, overly committed, hard-working, aggressive, and competitive individuals. Many investigators have shown a relationship with the onset of myocardial infarction and type A personality.⁶⁻⁸ The type A personality was studied in the Framingham study by Haynes et al,⁹ who found a significant correlation in both men and women with the occurrence and severity of heart disease to the presence of type A personality.

From the Division of Family and Community Medicine, University of California—San Francisco, San Francisco, California. Requests for reprints should be addressed to Dr. Jonathan E. Rodnick, Room AC-9, Division of Family and Community Medicine, University of California—San Francisco, San Francisco, CA 94143.

Methods

Common Health Care is a nonprofit, community-based organization in Santa Rosa, California, that has advocated and conducted health screening, health education, and health promotion for the past decade. Since its inception, CHC has screened over 25,000 individuals in northern California.

The study, which began in the summer of 1980, recruited 572 participants from the San Francisco Bay area following advertisements to local corporations, community organizations, and the public at large. Most individuals paid \$75 for a three-year health promotion program; however, approximately 125 low-income individuals joined the program for a \$25 charge.

The participants were administered an initial health screening and were asked to select areas for health improvement. The initial health screening consisted of (1) a health history questionnaire, (2) basic physical measurements (weight, height, blood pressure, lung capacity, respiratory flow rates), (3) laboratory measurements (urine analysis, complete blood count, fasting sequential multiple analysis (SMA-15), including a serum cholesterol test), and (4) additional questionnaires. Some of these data were used in completing the health hazard appraisal—a statistical predictor of future disease based on a complex health risk analysis.¹⁰

One of the components of the health hazard appraisal used in this analysis is the heart attack composite risk factor, which is the result of a mathematical computation of the weighed risk factors of cholesterol, blood pressure, smoking, exercise, diabetes, family history, and weight. The risk factor assessment is based on the Geller-Genser tables using data from Framingham and other studies. Cholesterol was photocolometrically measured by a commercial laboratory after a 12-hour fast. Blood pressure was measured by the same observer for all participants using the fifth sound for the diastolic reading. Cigarette smoking was self-rated by the number of cigarettes smoked per day. The amount of exercise was ascertained by asking participants to rate themselves from 1 (sedentary) to 4 (vigorous), with each level defined in equivalent measures of current amount of regular, programmed exercise.

The Schedule of Recent Events was used to assess recent potentially stressful changes in a person's life. This scale is based on assigning

numerical values to a list of social or financial changes that have occurred in the past year. These numbers are summed, and the magnitude of the resulting number is roughly proportional to the individual's chance of developing disease.

Additional questions assessed personality and motivational characteristics. A five-item questionnaire that was developed highlighted the major components of the coronary prone behavior pattern. Participants rated themselves from 1 (lowest) to 7 (highest) on competitiveness, goal orientation, drive, immersion in tasks, and time consciousness. The results for each answer were then summed. Participants could score from a low rating of 5 (not coronary prone behavior) to a high of 35.

The initial health screening was administered over a six-month period to 572 individuals. Prior to administration the directions for filling out the questionnaire were supplied through a prepared presentation.

Results

The 572 participants were predominantly white (96.7 percent), middle-aged (mean age, 43.6 years), middle income (median 1980 estimated income, \$18,000), employed (88.8 percent), and single (56.9 percent). There were 344 women and 228 men.

The medical risk factor results were as follows: (1) the mean serum cholesterol was 220 mg/dL (SD \pm 45.4), (2) the mean blood pressure was 126/82 mmHg (SD \pm 19.6/11.2), (3) 15.0 percent indicated they smoked cigarettes daily (SD \pm 14.16/d), (4) 13.3 percent reported they were sedentary, 40.7 percent did some exercise, 27.3 percent exercised moderately, and 18.7 percent did vigorous daily exercise, and (5) 15.8 percent were significantly overweight (equaling or exceeding 120 percent of recommended weight for individuals of medium frame).

The heart attack composite risk factor is the principal variable in the health hazard appraisal relating to cardiovascular disease risk, representing a number that is a ratio of an individual's risk of heart attack compared with peers of similar age, race, and sex. An average person theoretically

Table 1. Correlations of Psychosocial and Physiological Parameters (n = 572)

Physiologic	Holmes-Rahe SRE** Scale	Coronary Prone Behavior Rating
Blood pressure, systolic	-.002*	0.7*
Blood pressure, diastolic	-.02*	.04*
Cigarettes smoked per day	-.05*	-.02*
Serum cholesterol	.05*	-.02*
Weight	-.06*	.05*
Exercise rating	-.02*	.13 (P=.003)
Heart attack composite risk	.05*	.002*

Pearson product-moment correlation coefficients with age held constant
 *Statistically not significant, P > .05
 **SRE—Schedule of Recent Events

would have a heart attack composite risk factor of 1.0. The heart attack composite risk factor for this group ranged from .05 to 6.8, with a mean of 0.84. The major reason for this low mean is a lower than average rate of cigarette smoking.

The average score of the participants on the Holmes and Rahe Schedule of Recent Events was 168. Thirty-five percent were between 0 and 100, 32 between 101 and 200, 19 between 201 and 300, 8 between 301 and 400, and 6 were higher than 401 (having potentially stressful changes in their lives). Although there were no sex differences in scores noted between men and women, there were racial differences. Latinos averaged 313, blacks 184, whites 164, and Asians 150. There was also a significant difference by occupation, ranging from those who were classified as unemployed (predominantly retired), who averaged 124, to those who were students, who averaged 226.

There was no statistical correlation between the Schedule of Recent Events and any cardiovascular risk factor—blood pressure, smoking, cholesterol, exercise level, or weight (Table 1). Interestingly, a weak correlation was noted between the Schedule of Recent Events rating and the coronary behavior rating ($r = .08$, $P = .04$ by Pearson product-moment correlation with age held constant).

The rating for coronary-prone behavior showed no significant correlation with blood pressure, smoking, or weight. There was a statistically sig-

nificant correlation between the rating and the self-reported level of daily exercise (ie, those who reported more coronary prone behavior traits also stated they did more exercise) (Table 1). However, there was no correlation between this rating and the overall cardiovascular risk as calculated for the health hazard appraisal.

Discussion

Despite an empiric sense to the contrary, frequent or marked social or economic changes as measured by the Schedule of Recent Events were not directly associated with increased cardiac risk factors (smoking, high blood pressure, lack of exercise, etc) in this group. Although these changes may predispose to the chance of disease in general, if they predispose to heart disease, this study did not identify any factor that might be a mediator.

Horowitz et al¹¹ have found a significant correlation between smoking and the score on a modified life events questionnaire. That study was part of the Multiple Risk Factor Intervention Trial, and a major selection bias was present—the 575 participants were of high risk and were selected by a multiple, logistic-factor equation (and were prob-

ably not representative of the general population).

A weak statistically significant correlation was found between an individual's score on the coronary behavior measure and the Holmes and Rahe score. *Somes et al*¹² also found that individuals who scored very high on a type A personality scale had a significantly greater number of recent life changes. Furthermore, they studied college students and therefore did not include as wide a spectrum of the population.

The most significant association in this report is that of reported exercise and coronary prone behavior. Perhaps the aggressive and competitive individual is more likely to undertake a regular exercise program. Exercise raises high-density lipoprotein (not measured by this study) as well as lowering blood pressure and so may help ameliorate some of the increased risk from this personality type.

The relationship between life changes and coronary risk factors has not been examined extensively. The only reported study, by *Rahe et al*,¹³ showed a statistically significant correlation between systolic blood pressure and life change units in East Finland (an area with a high incidence of congestive heart disease) but no correlation with smoking or cholesterol. The relationship between type A personality and other cardiovascular risk factors has been examined by others. The data presented here are consistent with the previously noted lack of statistical relationships among these variables.¹³⁻¹⁶ This study reinforces the notion that coronary prone behavior is probably an independent risk factor for coronary artery disease.¹⁷

It is important, however, to note that the participants in this study were individuals who were interested in their health risks (most paid out of pocket for the testing and education). Before generalizing, it should be kept in mind that the study sample was not representative of all ethnic or socioeconomic groups.

There are very few statistical correlations between the psychosocial and physiological predictors of cardiovascular disease as measured in this study. The main implication is that an accurate assessment of risk for cardiovascular disease needs a multifactorial (and multilevel) approach, including variables that reflect on an individual's inner biochemical environment as well as the outward psychosocial, social, and occupational ones. This study indicates that psychological stresses—

from recent life changes or from behavior patterns that are risk factors for heart disease—are not strongly associated with standard risk factors, thereby reinforcing the concept that coronary heart disease and its precursor, arteriosclerosis, have multiple independent risk factors. An over-used and time-tested closing, that more research is needed, is certainly applicable. The measurement of risks for heart disease has still to overcome Cartesian dichotomy between mind and matter.

References

1. Holmes TH, Rahe RH: The social readjustment rating scale. *Psychosom Res* 11:213, 1967
2. Byrne DG, Whyte HM: Life events and myocardial infarction revisited: The role of measures of individual impact. *Psychosom Med* 42:1, 1980
3. Rahe RH, Bennet L, Romo M, et al: Subject's recent life changes and coronary heart disease in Finland. *Am J Psychiatry* 130:1222, 1973
4. Rahe RH, Romo M, Bennet L, et al: Recent life changes, myocardial infarction and abrupt coronary death studies in Helsinki. *Arch Intern Med* 133:221, 1974
5. Carasso R: Personality type, life events and sudden cerebrovascular attack. *Int J Neurosci* 14:223, 1981
6. Byrne DG: Type A behavior, life events and myocardial infarction: Independent or related risk factors? *J Med Psychol* 54:371, 1981
7. Jenkins CD: Recent evidence supporting psychosocial and social risk factors for coronary disease. *N Engl J Med* 294:987, 1976
8. Jenkins CD, Rosenman RH, Zyzanski SJ: Prediction of clinical coronary heart disease by a test for the coronary-prone behavior pattern. *N Engl J Med* 290:1271, 1974
9. Haynes SG, Feinlab M, Kannel WB: The relationship of psychosocial factors to coronary heart disease in the Framingham study. *Am J Epidemiol* 111:37, 1980
10. Hall JH, Zwemer JD: *Prospective Medicine*. Indianapolis, Methodist Hospital of Indiana, 1979
11. Horowitz MJ, Hulley S, Alvarez W, et al: Life events, risk factors, and coronary disease. *Psychosomatics* 20:586, 1979
12. *Somes GW, Garrity TF, Marx MB*: The relationship of coronary-prone behavior pattern to the health of college students at various levels of recent life change. *J Psychosom Res* 25:565, 1981
13. Rahe RH, Arajarvi H, Arajarvi S, et al: Coronary heart disease in east versus west Finland. *J Psychosom Res* 20:431, 1976
14. Chesney MA, Black GW, Chadwick JH, et al: Psychological correlates of the type A behavior pattern. *J Behav Med* 4:217, 1981
15. Haynes SG, Levine S, Scotch NA, et al: The relationship of psychosocial factors to coronary disease in the Framingham study. *Am J Epidemiol* 107:384, 1978
16. Rosenman RH, Brand RJ, Jenkins CD, et al: Coronary heart disease in the Western Collaborative Group Study. *JAMA* 233:872, 1975
17. Dembroski TM, Weiss SM, Shields JL, et al: *Coronary-Prone Behavior*. New York, Springer-Verlag, 1978