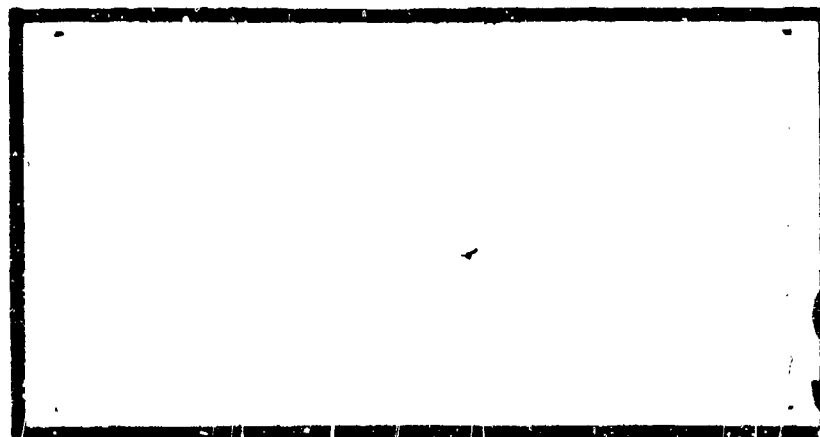
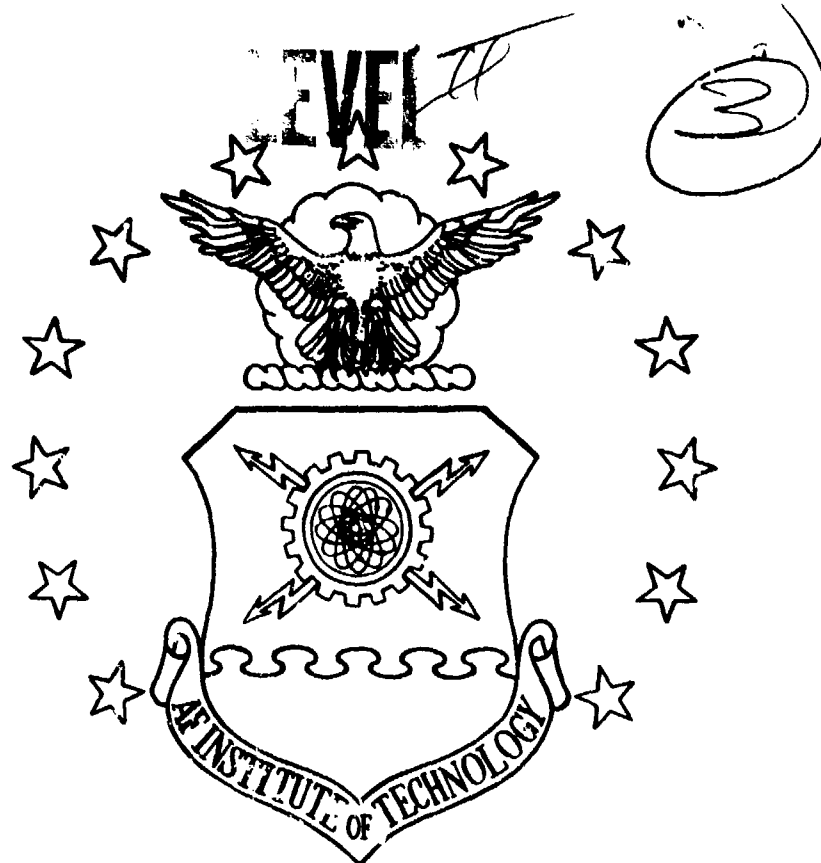


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INDIVIDUAL AND ORGANIZATIONAL
VARIABLES' RELATIONSHIP TO
CORONARY HEART DISEASE

Captain Samuel P. Fye, USAF, MSC
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AFIT

LSSR 3-81



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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER LSSR-3-81	2. GOVT ACCESSION NO. AD-A205	3. RECIPIENT'S CATALOG NUMBER 728
4. TITLE (and Subtitle) INDIVIDUAL AND ORGANIZATIONAL VARIABLES' RELATIONSHIP TO CORONARY HEART DISEASE,		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis,
7. AUTHOR(s) Samuel P. / Fye, Captain, USAF, MSC Charles W. / Staton, First Lieutenant, USAF		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS School of Systems and Logistics Air Force Institute of Technology, WPAFB OH		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS (12) 462
11. CONTROLLING OFFICE NAME AND ADDRESS Department of Communication and Humanities AFIT/LSH, WPAFB OH 45433		12. REPORT DATE June 1981
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. NUMBER OF PAGES 150
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES 7 AUG 1981 APPROVED FOR PUBLIC RELEASE AFR 190-17		Air Force Institute of Technology (ATC) Wright-Patterson AFB, OH 45433 FREDRIC C. LYNCH, Major, USAF Director of Public Affairs
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) STRESS CORONARY HEART DISEASE STRESS ASSESSMENT ORGANIZATIONAL BEHAVIOR MYOCARDIAL INFARCTION		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Thesis Chairman: William H. Hendrix, Lieutenant Colonel, USAF		

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SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

Within the field of management there has been increasing interest in the physiological effects of stress, such as coronary heart disease and the organizational effects of stress such as poor productivity, absenteeism and labor turnover rates. It is estimated that costs associated to stress-related illness exceeds 18 billion dollars a year. Research was conducted with 351 Air Force personnel that examined the effect of 30 organizational variables such as job satisfaction, work overload and role ambiguity, and seven personal attributes such as Type A/Type B behavior pattern, locus of control and assertiveness on selected measures of stress which included blood chemistry and self-reported perceived stress.

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INDIVIDUAL AND ORGANIZATIONAL VARIABLES' RELATIONSHIP
TO CORONARY HEART DISEASE

A Thesis

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Logistics Management

By

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June 1981

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faculty of the School of Systems and Logistics in partial
fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

DATE: 17 June 1981


COMMITTEE CHAIRMAN

Dedication

This thesis is dedicated to our wives. Without their loving support and tolerance for the intolerable, our level of stress would have far exceeded any of those measured during this research.

Thank you Guynelle and Janet.

ACKNOWLEDGEMENTS

Research is not accomplished in an isolated environment. During the course of this project, numerous individuals aided immeasurably to its successful completion. We would like to thank the following for their invaluable advice and assistance:

Lieutenant Colonel William H. Hendrix

Major Nestor K. Ovalle

Major James M. Masters

Shirley M. Sawyer

Kathy M. Taylor

Laboratory personnel at the USAF School of
Aerospace Medicine, Brooks AFB, Texas

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CHAPTER I

INTRODUCTION

There has been an increasing interest in human stress in recent years with many propositions about its causes and effects. Of particular interest in the field of management are the physiological and organizational effects of prolonged stress.

A major consequence of the physiological effects of stress proposed by many sources is coronary heart disease (11; 21; 25; 34:347; 51). The link between stress and coronary heart disease can be explained as follows: stress causes increased levels of cholesterol. The accumulation of cholesterol deposits causes arteries to harden and narrow as the cholesterol builds up in the arterial wall. After a period of time, the blood flow through the artery is severely restricted, increasing the risk of blood clots forming in arteries which is the major cause of heart attack (25; 51). How stress is linked to higher levels of cholesterol can be demonstrated by a study by Friedman, Rosenmann and Carroll (18:852). In this study, tax accountants were examined to determine the effects that a heavy work load, a high level of responsibility, time pressure, and conflict and ambiguity in job roles would have

on levels of cholesterol. It was discovered that there were marked increases in cholesterol levels as the tax filing deadline approached. Once the deadline passed, the cholesterol levels decreased over a two-month period before returning to normal.

A second physiological component affected by stress is cortisol level. Three studies suggest that as stress is experienced there is a resulting increase in the cortisol level (6:956; 28:49; 46:815). However, in a fourth study (8:181), results indicated that chronic stress lowered the cortisol level. There is the possibility that the difference between the first three studies and the fourth can be explained based on whether there is chronic stress present or acute stress. Stress in short-term duration (acute stress) is believed to increase cortisol levels while long-term stress (chronic stress) may decrease cortisol output by exhausting the adrenal output capacity (8:181). From a review of the first three studies cited, it appeared that acute stress was present, while in the fourth study, chronic stress was present. Cortisol plays an important role in the health of humans since it protects against the effects of trauma, promotes glucogenesis, increases muscle strength, and increases blood flow (8:181). Cortisol's importance to this research is also based on the evidence that cortisol production may have an important relationship with cholesterol production (57).

A third physiological component, HDL cholesterol, is believed to be inversely related to coronary heart disease. Unlike conventional risk factors that increase the risk of coronary heart disease, HDL cholesterol appears to be a risk-lowering factor (30). It is believed that HDL cholesterol may reduce risk of coronary heart disease by transporting cholesterol from the arterial wall cells to the liver for excretion (30).

Finally, a physiological component derived by dividing cholesterol by HDL cholesterol has been associated with the risk of coronary heart disease (57). The greater the value of the ratio, the greater the risk of coronary heart disease.

In addition to the physiological effects of stress there are also the organizational effects of stress. Ivancevich and Matteson (25) contend that the organizational effects of stress result in

. . . absenteeism, poor industrial relations and poor productivity, high accident and labor turnover rates, poor organizational climate, antagonism at work and job dissatisfaction.

It is estimated that costs associated with stress-related illnesses among executives is eighteen to twenty-five billion dollars each year, although it is difficult to measure what percentage of those costs may be the result of stress-induced or stress-aggravated illness (25).

If it is accepted that a causal relationship exists between stress and coronary heart disease and that stress has detrimental effects on organizations, the next logical step would be to identify the stressors and work toward their elimination or reduction, or train people how to cope with stress. Many studies (refer to Literature Review) attempted to find a direct link between specified stressors and stress or coronary heart disease. Although these studies indicated a significant relationship between stress and independent variables such as role ambiguity, poor job satisfaction, and poor relations with supervisors, researchers began to notice that traits within individuals acted as moderators between the stressor and the magnitude of stress (21). In essence, they found that individual differences are important in examining why a situation may be stressful to one person and not to another (21).

The next step in research is to examine situational factors and how they interact with individual predispositions in explaining susceptibility to stress and coronary heart disease (21). Some research efforts have already been directed toward this end (11). With this in mind, this research effort was directed toward further exploration of the direct relationships between a stressor and the stress response along with the person-situation interactions and their moderating effect. The specific research questions for this research are:

1. What are the organizational and individual factors which predict stress?

a. What organizational and individual factors are predictive of cortisol levels?

b. What organizational and individual factors are predictive of perceived job stress?

c. What organizational and individual factors are predictive of perceived external (non-job) stress?

d. What organizational and individual factors are predictive of perceived cumulative stress (response to job stress (+) response to external stress)?

e. What organizational and individual factors are predictive of perceived multiplicative stress (response to job stress (x) response to external stress)?

2. What are the organizational and individual factors that are predictive of coronary heart disease potential?

a. What organizational and individual factors are predictive of cholesterol levels?

b. What organizational and individual factors are predictive of HDL cholesterol level?

c. What organizational and individual factors are predictive of the cholesterol/HDL cholesterol ratio (measure of cholesterol ($\div$) by measure of HDL cholesterol)?

d. What organizational and individual factors are predictive of the product of cholesterol (x) cortisol?

Definitions

1. Coronary Heart Disease--arteriosclerosis caused by an accumulation of cholesterol in the arteries (25).

2. Individual Components--components of the individual consisting of demographics such as age, sex, behavioral patterns such as Type A-Type B behavior, locus of control, and assertiveness. Other factors unique to individuals such as recent death in the family, smoking, and divorce are also included.

3. Organizational Components--components of the work environment such as role ambiguity, job satisfaction and supervisory relationships.

4. Physiological Components--levels of cholesterol, HDL cholesterol, cortisol, and cholesterol/HDL cholesterol ratio.

5. Stress--

. . . adaptive response, mediated by individual characteristics and/or psychological processes, that is a consequence of any external action, situation or event that places special physical and/or psychological demands upon a person [25].

CHAPTER II

LITERATURE REVIEW

The purpose of the literature review was: (1) to identify independent variables and moderating variables that could be investigated to determine their individual effect or combined effect on stress and coronary heart disease, and (2) to substantiate the relationship between coronary heart disease and stress with the dependent variables of cholesterol, HDL cholesterol, cortisol, and the cholesterol/HDL cholesterol ratio. The independent variables were classified into two groups: (1) job environment facets, and (2) personal facets.

The research concerning job environment and its relationship to stress and coronary heart disease usually examined the relationship from a particular dimension such as role conflict or overall job satisfaction. The list of job environment facets found through the literature review is as follows:

Job Environment Facets

- Job Satisfaction (overlaps other facets)
- Role Conflict/Ambiguity
- Organizational Structure
- Work Load/Time Pressure
- Work Schedule
- Task Characteristics
- Goal Setting
- Change in Work Responsibilities

Relations with Supervisor
Relations with Coworkers
Policies and Regulations
Responsibility for People
Equipment Limitations

Review of research concerning personal attributes
and their relationship to stress revealed the following
facets:

Personal Facets

Behavior Patterns
 Type A/Type B
 Locus of Control
 Assertiveness
Personality Traits
Life Events
 Death of Spouse
 Divorce
 Marital Separation
 Death of Close Family Member
 Personal Health
Cigarette Smoking
Stressful Lifestyle
Exercise
Demographics
 Age
 Sex
 Education
 Weight
 Height

Discussions of research related to job environment
facets and personal facets are as follows:

Job Environment Facets

Job Satisfaction

Job satisfaction is often thought to be a function
of the relationships between what one wants from a
job and what the job is perceived as offering or
requiring [42:144].

Many facets of the job environment can be contributors to
job satisfaction or job dissatisfaction. These may include

task variety, autonomy, role congruence, or recognition, just to name a few. Job dissatisfaction has a strong negative relationship to occupational stress (19:495; 24:272; 50:861; 48:266).

Research by Russek and Zohman (48:226) examined the relationship between heredity, diet, and occupational stress in coronary heart disease of young adults. Over a ten-year period analysis was conducted of one hundred patients between the ages of twenty-five and forty years manifesting coronary disease and a similar group of one hundred normal control subjects. Of the one hundred patients with coronary disease, eighty-nine had a myocardial infarction confirmed by electrocardiographic studies while the remaining eleven patients suffered from angina of effort without infarction. All the patients were seen in private practice or in various hospitals. Interviews were conducted during convalescence concerning health history, habits, diet, hereditary influences, sources of tension and events preceding the onset of clinical symptoms. Interviews were also obtained on a control group of one hundred healthy subjects of similar age, occupation and ethnic origin. Results of the study were as follows:

1. History of cardiovascular disease in one or both parents was present in 67 percent of the coronary

patients, while 40 percent of the control group had parents with cardiovascular disease.

2. Of the patients with coronary disease, 26 percent of the patients were unmistakably obese as compared to 20 percent of the patients in the control group.

3. Fifty-three percent of the coronary patients consumed high amounts of fat in their daily diet as opposed to 20 percent of the control group.

4. Within the patients with coronary disease, 91 percent of the patients had been under unusual occupational stress prior to the onset of clinical symptoms. Twenty-five percent of the patients worked full-time jobs during the day and a second job during evening hours. An additional 46 percent of the coronary patients worked in excess of sixty hours a week. In another 20 percent there was unusual fear, insecurity, discontent, frustration, restlessness or inadequacy in relation to employment. Only 20 percent of the subjects in the control group showed comparable stress and strain in relation to occupation. The frequency of occupational stress was four and one-half times greater in the coronary patients.

In interpretation of the results, the authors state that

. . . taken individually, the most impressive feature serving to differentiate the young candidate for coronary disease is found in relation to occupational stress.

Sales and House (50:861) studied job dissatisfaction as a possible risk factor in coronary heart disease. In their study they used various occupational groups for which the mortality rate for coronary heart disease and the average amount of job satisfaction were known. To examine the relationship between job satisfaction and coronary heart disease three studies were conducted. Results of the three studies are as follows:

1. The first study involved sixteen different occupational groups consisting of these categories of blue-collar workers;

- Farmers
- Skilled Printers
- Skilled Steelworkers
- Textile Workers
- Unskilled Steelworkers
- Unskilled Automobile Workers
- Skilled Automobile Workers
- Paper Workers

and these categories of white-collar workers;

- Urban University Professors
- Biologists
- Physicists
- Chemists
- Lawyers
- Managers
- Sales Persons
- Clerical

Job satisfaction was estimated from the percent of individuals within each group who responded "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?" A standard mortality ratio (SMR) based on tabulated deaths due to arteriosclerotic disease for a particular occupation, divided by the expected deaths for the occupation, then multiplied by 100, was used to measure coronary disease (SMR is published by the Department of Health, Education, and Welfare). The percent satisfied within each occupational group was then compared to the standard mortality ratio. The results indicated a strong relationship between job satisfaction and coronary disease. For white-collar workers a multiple correlation coefficient of ($R = -0.630$, $P < 0.05$) was observed while in the blue-collar workers the multiple correlation coefficient was ($R = -0.716$, $P < 0.05$). The correlation between status and the SMR was not statistically significant.

2. In the second study, data was collected on twelve occupational groups consisting of;

- Professors, Librarians
- Advising Professions
- School Teachers
- Scientists, Physicians
- Accountants, Auditors
- Engineers
- Technicians
- Managers
- Bookkeepers
- Clerical
- Sales (Goods, Service, and clerks)
- Other Sales

Job satisfaction was measured by the percent 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 on the items: "chance to use your skills and abilities," and "chance to learn or try out new things," while extrinsic satisfaction was measured by the subjects' satisfaction with their pay, job security, kind of workplace, and coworkers. As in study 1, the standard mortality ratio was used as a measure of coronary disease. The results showed a significant multiple correlation coefficient ($R = -0.547$, $P < 0.05$) between total job satisfaction and rates of coronary heart disease. The multiple correlation coefficient between intrinsic satisfaction and coronary disease was ($R = -0.488$, $P < 0.10$) while the multiple correlation coefficient between extrinsic satisfaction was ($R = -0.355$) and not significant.

3. In study three, one hundred employees from each of twenty-one organizations were selected for analysis. Each employee responded to a job description questionnaire designed to measure five varieties of satisfaction (one intrinsic and four extrinsic). The employees were divided into white-collar groups and blue-collar groups as in study number 1. Also as in studies 1 and 2, the standard mortality ratio was utilized to measure coronary disease. The multiple correlation coefficient between job satisfaction and coronary disease in the white-collar workers was

($R = -0.635$, $P < 0.01$), intrinsic satisfaction ($R = -0.677$, $P < 0.005$) and extrinsic satisfaction ($R = -0.624$, $P < 0.01$). For blue-collar groups, the multiple correlation coefficient between total satisfaction and coronary disease was ($R = -0.137$), intrinsic satisfaction ($R = -0.220$), and extrinsic satisfaction ($R = -0.087$) with none of the three measures statistically significant.

All three studies by Sales and House indicated a negative relationship between job satisfaction and coronary heart disease, although the multiple correlation coefficient for blue-collar workers was not significant in the third study. Although the methodology might be questioned concerning the one-question measures of job satisfaction and computation of the standard mortality ratio, there appears to be sufficient evidence that job satisfaction is inversely related to coronary artery disease.

Role Conflict/Ambiguity

According to Latack (31:89) role conflict and role ambiguity are defined as follows:

Role conflict occurs when incongruous expectations are associated with a role; role ambiguity is the degree to which information is lacking on expectations, methods, and consequences of role performance.

The literature indicated that these two variables are positively related to stress (as role conflict/ambiguity increases stress increases) (34:347; 10:713; 1:561; 39:270; 3:665; 25; 11; 53:116; 20:46; 19:594; 31:89;

49:325; 35:172). Presented below are selected studies demonstrating the correlation between role conflict/ambiguity and stress.

Parkington and Schneider (39:270) hypothesized that the discrepancy between an employee's service orientation and that employee's view of management's service orientation caused increased job stress (role ambiguity and role conflict) which in turn caused organizational dissatisfaction, frustration, perceived poor customer service, and turnover intentions. Service orientation in this sense could simply be defined as the "system versus client" relationship.

The sample for this research was 263 bank branch employees from 23 branches of a large bank. Their questionnaire results were analyzed and the hypothesis below was supported. Specifically, the hypothesis was that the difference between the way the bank's employees described the kind of service they think the bank should have and the way they describe upper management's view of service orientation is strongly related to the way that the employee views his work environment. The greater the difference, the more the employee experiences role ambiguity and role conflict. These role stress perceptions are in turn related to organizational dissatisfaction, intentions to terminate their employment, frustration, and the feelings that the customers were receiving a poor quality of service.

Miles (35:172) examined the relationships between role requirements and experienced role stress (role conflict/ambiguity) among 202 research and development professionals. The instruments administered measured role conflict, and intrasender conflict. As described by Miles, intrasender conflict

. . . occurs when the focal person perceives that demands from one role sender oppose demands from one or more other senders. Person role conflict is the perceived incongruence between the role requirements placed on a focal person and his/her orientations, interests, and values. Intrasender conflict is perceived incongruence between various demands placed on the focal person by a single role sender, and role overload exists when the focal person cannot accomplish all of the role demands received [35:172].

Role ambiguity was also measured by a questionnaire. Role ambiguity was defined "as the lack of clarity of role expectations and predictability of role performance outcomes."

Role requirements were determined by asking each person to rate the extent to which each of fifty job activities was a part of his/her role. Activities were classified into supervisory activities, boundary spanning activities and scientific research activities.

Comparison of role requirements and role conflict showed a direct relationship between general role conflict and the integration and boundary spanning activities ($P < 0.01$). Intrasender conflict was also directly related to integration and boundary spanning activities

($P < 0.01$). Role conflict and intrasender conflict were also directly related to personnel supervision ($P < 0.05$). Role ambiguity was inversely related to integration and boundary spanning activities ($P < 0.01$) as well as with supervisory activities ($P < 0.05$). Role conflict and role ambiguity were not significantly related to scientific research activities.

These results indicate that boundary spanning positions within or between organizations lead to role conflict and role ambiguity. The same appears true for supervisory positions although the relationship is not as strong as is the case for boundary spanning positions.

Chaplan and Jones (10:713) examined the effects of work load, role ambiguity, and Type A personality on anxiety, depression, and heart rate. The study was longitudinal in design and centered around the stress experienced in conjunction with the shutdown of a large computer facility at a University.

One hundred twenty-two males (mean age = 23), comprised the sample with 91 percent of the sample represented by graduate and undergraduate students, and the remainder were faculty or postgraduate fellows. Questionnaires were completed by the subjects during a designated time 1 and a designated time 2. Time 1 was associated with the stressful event of the computer shutdown while time 2

was associated with a period chosen for its relatively low stress level. The questionnaires measured:

1. Subjective quantitative work load and role ambiguity based on a five-point ordinal scale with estimated reliability of .77 and .82 respectively.

2. Type A personality based on four items with a reliability of .73.

3. Anxiety, depression, and resentment with cross-sectional reliabilities of .88, .70, and .87 respectively.

In addition to the questionnaire, heart rates were taken following completion of the questionnaire at time 1 and upon completion of the questionnaire at time 2. The overall results showed role ambiguity was positively associated with anxiety, depression, and resentment. Anxiety was positively related to heart rate. Findings regarding Type A and Type B behavior showed that correlation between changes in subjective work load and changes in anxiety was .54 for the Type A persons but only .27 for the Type B persons. There was a similar tendency for the relationship between changes in anxiety and heart rate to be higher for the Type A ($R = .45$, $P < .005$) than for the Type B persons ($R = .22$, $P < .10$). The investigators concluded that "stress had its greatest effects on strain in the hard-driving, involved Type A person."

Organizational Structure

Many sources indicate a relationship between the organizational structure and stress (11; 4:26; 34:347; 24:272; 36:258; 3:665; 52:66). Organizations can be viewed as either tall or flat depending on the number of intermediary levels between the top and the bottom of the organization. In relation to structure, stress may be associated with the mismatch between technology and the organizational structure (52:66). Also to be considered, is the relationship of stress to the nature of the task, the degree of formalization in the organization, and the amount of integration within the organization. The following studies are presented which examine these possibilities.

Ivancevich and Donnelly (24:272) examined the relationship between stress and organizational structure. They presented five hypotheses dealing with various dependent variables, but this review will focus on the following hypothesis:

If the organizational structure is flat, trade salesmen will perceive less job-related anxiety-stress than trade salesmen in medium and tall organizational structures [24:272].

The subjects for this study were 295 salesmen from three large organizations. Anxiety-stress was measured on a nine-item scale based on the participants' perception of being disturbed by job-related problems. Organizations were categorized into tall, medium, and flat. The

classification of tall, medium, or flat was measured by a steepness ratio based on number of peer relationships and number of relationships between individuals as shown on the organizational charts.

The results indicated that salesmen in flat organizations perceived significantly less stress than those in medium and tall organizations. It is important to note that a flat structure is probably appropriate to the nature of the task (that of being a salesman).

Schuler (52:66) examined role conflict and ambiguity as a function of the Task-Structure-Technology Interaction. His hypothesis was that

. . . role conflict and ambiguity will be lower when there is a "fit" or congruence among task-technology-structure than when there is a "lack of fit" or incongruence among task-technology-structure.

The organization investigated was a large mid-western public utility categorized as having a complex technology based on the organization's engagement in advanced electrical and computer equipment. For purposes of the study,

. . . tasks low on variety, autonomy, feedback, identity, and significance were referred to as simple tasks, while the tasks high on those characteristics were obtained using a Job Diagnostic Survey.

Organizational structure which was called organic

. . . was characterized by high intergroup cooperation, frequent task feedback, open communication channels, low formalization of rules and procedures, and lack of adherence to the chain of command.

The term mechanistic structure referred to

. . . an organization with communication primarily directed downward, high formalization of rules and procedures, adherence to the chain of command, low intergroup cooperation, and infrequent task feedback.

Organizational structure was measured based on an organizational practices questionnaire. Role conflict and ambiguity were measured based on an eight-item and six-item scale, respectively. The author used the word "fit" or "congruence" for a combination of simple task-mechanistic structure-low complexity technology or complex task-organic structure-high complexity technology. Incongruence referred to any other combination of those variables.

The results of the 272 employees participating in the study indicated that the employees in the congruent relationship (complex task-organic structure-high complexity technology) perceived significantly less role ambiguity than those in incongruent relationships. The employees in the simple task-mechanistic structure-high complexity technology perceived the highest level of role ambiguity. Employees in the congruent relationship also reported lower levels of role conflict.

These two studies show strong evidence that organizational structure may lead to role ambiguity and role conflict. Important in the second study (52:66) is the hypothesized relationship between the task-structure-technology interaction and role conflict and ambiguity.

Work Load/Time Pressure

Many sources indicate a relationship between work load, time pressure and stress (11; 19:594; 34:347; 10:713; 1:561; 12:104; 2:665; 53:116; 20:46). Stress occurs when the work load exceeds the individual's resources required to accomplish the tasks assigned (20:46).

Sales (49:324) examined role overload as a risk factor in coronary disease. Sales defined role overload as a condition in which the individual is faced with a set of obligations that required him to do more than he is able in the time available. He employed an experiment to create role overload by having subjects attempt to complete anagrams in less time than was required for their completion. At the same time another group of subjects was given anagrams that required less time to complete. All seventy-three male underclassmen who participated in the experiment had blood samples taken before and after the experiment in order to obtain cholesterol levels.

(High cholesterol levels are associated with coronary disease.) In the overload condition approximately 35 percent more anagrams were given than could be completed while in the underload condition the participants were kept waiting about 30 percent of the time. In addition to these objective measures of overload, there were measures of participants' subjective work load and their enjoyment of the task.

Results for participants in the objective overload condition showed a mean increase in cholesterol of 5.56mg./100ml. while the objective underload participants showed a decrease in mean cholesterol of 0.46mg./100ml. These increases and decreases were over a one-hour period and showed an approximate 5 percent change from the participants' mean initial cholesterol levels. Subjects who were objectively overloaded showed mean increases in serum cholesterol regardless of their subjective work loads. Objective underloaded participants with subjective underload also exhibited mean increases of cholesterol. Surprisingly, participants who were objectively underloaded and who felt high subjective work loads showed mean decreases in cholesterol. With relation to job satisfaction, those participants who enjoyed working on the experiment showed mean decreases in cholesterol while individuals who disliked working on the experiment showed mean increases in cholesterol. Of interest is the comment the author makes concerning the participants who experienced objective underload but who felt they had a large amount of work to do which resulted in significant mean decreases in serum cholesterol.

The data may seem inexplicable until one recognizes that these subjects saw themselves as performing extremely well on a task which seemed to be quite difficult. The data suggest that success experiences of this sort may have a beneficial biochemical effect just as failure experiences such as those induced by objective overload, may have a deleterious biochemical effect.

Chaplan, Cobb, and French (9:211) explored the relationship between white-collar work load and cortisol. Specifically, the study examines the effects of work load on the circadian rhythm (Daily Cycle) of cortisol. The measure of work load was provided by a quantitative work load index, a nine-item self-report measure. Work loads were classified as high load, medium load, and low load. Cortisol levels were obtained through blood samples collected between 0900 and 1600 hours. A mean value for cortisol level was computed for each group of high, medium and low work load groups. The mean values of cortisol were then plotted to examine the presence or absence of diurnal (daily) cortisol patterns among work load groups.

The results showed that the degree of work load (high, medium, and low) significantly altered the cortisol diurnal pattern. With high work load, the cortisol level was lower in the morning when compared to cortisol levels for medium and low work load groups; then increased until about midday and then decreased in late afternoon. In the medium work load group, the cortisol level remained relatively level from morning until midday, then descended toward late afternoon. In the low work load group, the cortisol level was higher than high and medium work load groups, but then steadily descended through midday and throughout the afternoon. The cortisol diurnal pattern

for low work load is representative of the clinically normal pattern (57).

The authors explain that the lower cortisol level for high work load groups may be caused by exhausting adrenal output, by suppressing its reactivity to chronic stress, or due to a shift in the cycle by staying up late.

Russek and Zohman (48:266) demonstrated a positive correlation between work load and coronary heart disease. This research was discussed previously in this literature review in connection with job satisfaction. Significant in their findings was that 25 percent of the coronary patients worked full-time jobs during the day and a second job during evening hours. An additional 46 percent of the coronary patients worked in excess of sixty hours a week.

All three studies indicate a relationship between work overload and physiological components such as cholesterol and cortisol along with direct relationship to coronary disease. Cholesterol and cortisol play a significant role in explaining coronary heart disease. However, job satisfaction must be viewed as a possible moderating variable between work overload and stress (49:325; 50:861).

Work Schedule

The literature review (11; 14:79; 34:347; 3:665) revealed a relationship between work schedules and stress. A work schedule includes such aspects as shift work,

changing shifts and the average daily hours worked. Also included is the number of days worked per week (the four-day work week).

Field (14:79) suggests that changes in work hours results in stress, although the nature of the changes was not specified. The association may have been in regard to rotating shifts or periodic changes in the number of hours worked.

Ivancevich (23:717) examined the effects of the shorter work week on selected satisfaction and performance measures. A manufacturing company was selected for the study which consisted of 1,140 managerial and operating employees. The company consisted of four divisions. It was agreed to establish two divisions on a four-day, forty-hour work week to be studied over a twelve-month period while the other two divisions remained on a five-day, forty-hour schedule for comparative purposes.

A questionnaire measuring job satisfaction, anxiety-stress, and unexcused absence rate was distributed to all four divisions over a thirteen-month period. Measurement periods were broken down to (a) one month before conversion, (b) three months after conversion, and (c) twelve months after conversion.

Results indicated a small, but significant change in job satisfaction of the four-day, forty-hour divisions. There was also a significant but small improvement in

perceived anxiety-stress in the four-day, forty-hour divisions. There was no significant improvement relevant to unexcused absences. The author suggested that the results supported the four-day, forty-hour work week and there was no evidence of any negative aspects. However, the author did add a word of caution; "The study was limited to a thirteen-month period, and it is possible that some of the effects may show up or diminish over a long period of time [23:717]." Ivancevich also indicated that the "Hawthorne effect" could not be ruled out.

The limited evidence presented here supports the idea that work schedule changes may affect stress levels. However, Field (14:79) indicates that changes cause stress while Ivancevich (23:77) showed that a work schedule change reduced stress. Intuitively, it would appear that the work schedule change would affect stress levels either positively or negatively depending on how the individual felt about the change.

Task Characteristics

The level of stress experienced can be related to task characteristics of the job itself (47:89) or stress can be related to the congruence or incongruence between organization structure-task-and technology (36:258; 52:66). Task structure can contain many dimensions such as complexity, variety, autonomy, feedback and may also be

influenced by the inherent nature of the job such as air traffic controllers, lawyers, and doctors.

Russek (47:89) examined the relationship between stress, tobacco, and coronary disease in North American Professional Groups. Russek believed that coronary disease was related to the relative stress of an occupational activity. To substantiate this belief, a survey of 12,000 professional men within the professions of medicine, dentistry, and law was conducted. Securities analysts were also included in this group of 12,000 men. Russek separated each professional class into various categories and ranked them in order of stressfulness. The ranking of stressfulness was then substantiated by qualified evaluators who submitted independent evaluations based on regularity of working hours, variety of activities, frequency and importance of deadlines and decisions, amount of hard work, opportunities for rest, and others. The rankings of the categories within each practice in increasing order of stressfulness was as follows: medicine--dermatology, pathology, anesthesiology, and general practice; dentistry--periodontia, orthodontia, oral surgery, and general practice; law--patient law (nontrial), other specialties, trial law, and general practice; and securities--security analysis and security trading.

Questionnaires were then sent out to the 12,000 participants which were designed to determine hereditary

background and prevalence of coronary heart disease and the time of onset of coronary heart disease in relation to the category of work. Information was also gathered concerning smoking habits and age.

The results indicated that coronary heart disease prevalence increased with advance in stress rank. General practitioners in each profession showed prevalence rates of coronary heart disease two to three times those of the specialists. Coronary heart disease prevalence also increased in relation to increasing age. Increases in smoking were also significantly correlated with advance in occupational stress. Significant in regards to smoking was the fact that coronary disease prevalence was greater in non-smokers than in ex-smokers.

Moch, Bartunek, and Brass (36:258) studied the effects of technology, organizational structure, and task congruence on the amount of role stress experienced by an individual. Their hypothesis was:

Managers whose jobs are less formalized, who receive considerable task, and supervisor feedback, and who have extensive horizontal contacts, will have subordinates (professionals and technicians) who report less role stress than subordinates of managers whose jobs are more constraining [36:258].

The variable measures were taken by a mixture of questionnaires and interviews. After performing correlational analysis on their data, they found that their hypothesis was partially substantiated. Specifically, it was

discovered that the formalization of the manager's role caused increased levels of role stress for the technical staff; whereas, the task and supervisor feedback aspects were associated more with the role stress of the professional staff.

Schuler (52:66) examined role conflict and ambiguity as a function of the task-structure-technology interaction. Results of this study were discussed in detail earlier in the literature review under the heading of role ambiguity/conflict. Of interest was the finding that increased stress was found in the incongruent relationship between the task-structure-technology interaction.

It can be concluded that task characteristics are related to stress and may be explained by the nature of the task itself or by the task-structure-technology interaction. Additionally, as we will see later in the literature review, interaction between personal attributes and the nature of the task are also significant in relation to the degree of stress experienced. It is possible to speculate that Air Force Specialty Codes within the Air Force may be significantly related to the degree of stress.

Goal Setting

One source suggested that participative goal setting reduced stress levels (41:241).

Quick (41:241) examined the dyadic goal-setting process as a buffering agent for stressors. He examined the largest division of a nationally-based insurance company and used forty-six personnel to measure the effect of dyadic, or participative, goal setting on stress. A longitudinal study was performed using three observations; one before formal training in goal setting, one five months after training, and a final measurement eight months after training. Questionnaires were used to measure role ambiguity and conflict. In addition, absenteeism due to illness was used as an additional indicator of stress. The results of the study showed a significant decline in the levels of role ambiguity/conflict five months after the goal-setting training. Eight months after the training role ambiguity and role conflict were still significantly lower than levels before the training, but they had increased over the levels measured five months after training. Absenteeism due to illness was significantly lower five months after training but after eight months the level of absenteeism was much higher than even the measurement period before training. The results indicate a possible Hawthorne effect. Absences due to illness was probably not a good measure due to lack of ability to control other illness producing circumstances besides stress.

Change in Work Responsibilities

Changes in work responsibilities include: promotions, changes in location, addition of work tasks, retirement, and change in organizations. These facets of change are believed to create stress (3:665).

Field (14:87) found that changes in work responsibility were positively related to risk of heart attack. Field developed a point scale composed of variables that related to heart attack potential. Each variable had a point value based on its significance as a predictor of heart attack. On an eleven to one hundred-point scale (higher end of scale indicates increased significance), change in work responsibilities had a value of 29.

Change in work responsibilities may be a form of acute stress (short-term) while in most circumstances the variables previously discussed are likely associated with chronic stress (long-term). This could have possible implications concerning the interpretation of cortisol levels (8:181).

Relations with Supervisor

In general terms, the relationship with a supervisor may be described as either "poor" or "good." However, when defining the characteristics of a good supervisor, what may be perceived as a good quality to one employee may not be perceived as a good quality to another employee.

These qualities may pertain to what extent the supervisor: is a good planner; represents the work group; performs well under pressure; provides adequate feedback; provides opportunities for autonomy; or provides a pleasant work atmosphere. In some situations, it may be appropriate to conclude that supervisors have some degree of control over many of the work environment variables previously mentioned that have been related to stress. In essence, when we find that role ambiguity causes stress, is it a function of the supervisor failing to adequately relate to the employee or is ambiguity caused by organizational weakness beyond the control of the supervisor? In a practical approach, the question of supervisor relationships with employees causing stress must be examined unidimensionally from the employees' perception based on a scale of how good or how poor his/her relationships are with the supervisor. Many sources indicated that a poor relationship with a supervisor contributed to stress (11; 53:116; 14:79; 34:347; 13:635; 3:665).

Field (14:79) conducted research to identify stressful episodes associated with heart attacks or other serious illness. He developed a scale to assess the magnitude of a stressful event with point values ranging from eleven to one hundred. One of the significant variables associated with stress was "trouble with boss" with a value of 23 points.

Policies and Regulations

Two articles (11; 74:665) indicated that policies and regulations are variables that are correlated with stress. The specific relationship between policies and regulations was not explained. However, one would suspect that the relationship would be situational based on the congruence or incongruence with the interaction of other variables such as the nature of the task or the structure of the organization (52:66). In other words, too many policies and regulations may be stressful in one circumstance while too few may be stressful in another circumstance.

Responsibility for People

Four sources (11; 4:26; 20:46; 3:665) indicated a relationship between responsibility for people and stress. The sources suggested that this facet might be included as a possible variable related to stress. This variable should be examined in relation to the individual attributes that would predispose individuals to experience increased stress or no additional stress when presented with increased responsibility for people. No empirical evidence was presented to suggest any specific relationship between personal attributes as moderating variables to the degree of stress experienced from increased responsibility for people.

Equipment Limitations

One investigator, Crump (12:104), proposed that increased stress can be experienced due to lack of equipment availability. It would appear that this would be particularly appropriate in situations where lack of adequate equipment leads to work overload. This idea could be expanded to include all resources such as manpower and finances which might be of particular concern in the Department of Defense environment.

Relations with Coworkers

Two sources propose a positive relationship between stress and poor relations with coworkers (19:594; 34:347). However, there was no empirical evidence to support their proposal. The degree of stress associated with relations with coworkers would probably be a function of the degree of interaction required by the job.

Personal Facets

Behavior Patterns

Type A and Type B. Type A behavior is characterized by a chronic sense of time urgency, a hard driving and competitive orientation, a distaste for idleness, and chronic impatience. Type B behavior is characterized by the opposite traits, i.e., more easy-going, able to relax, and not feeling the time urgency pressure.

Rosenmann, Friedman, Straus, Worm, Kositchek, Hahn, and Werthessen (43:15) investigated characteristics that were predictive of subsequent occurrences of manifest coronary heart disease. The study contained 3,500 men aged thirty-nine to fifty-nine from eleven participating business organizations in the San Francisco-Oakland Bay area and two in the Los Angeles area. Medical information was gathered by a field team visiting the subjects' organization which consisted of blood samples and pertinent cardiovascular data. Additionally, the subjects' overt behavior pattern was assessed by the field team by using a thirty-minute interview and a psychophysiological test. Based on the medical information a senior medical referee made the diagnosis of manifest coronary heart disease. When subjects diagnosed as having coronary heart disease were compared with behavioral patterns, it was found that Type A's were more disease prone than Type B's by a 2.21:1 ratio. In conclusion, the authors suggest that the findings do not substantiate the predictive value of assessment of the behavior pattern although a significant proportion of the subjects were predicted as coronary-prone on the sole basis of their exhibition of behavior pattern A.

Friedman and Rosenmann (17:96) examined three groups of men, selected solely according to their behavioral pattern. Group (A) of eighty-three men characterized by Type A behavior pattern, Group (B) of

eighty-three men characterized by Type B behavior and Group (C) of forty-six blind men characterized by Type B but also including a chronic state of anxiety or insecurity. These groups were compared against measures of blood cholesterol level, blood clotting time, incidence of arcus senilis, and clinical coronary artery disease. The results were as follows:

1. Serum cholesterol level--the average cholesterol level of all the Group A men was significantly higher (253 mg. per 100 ml) than that of Group B men (215 mg. per 100 ml) or Group C men (220 mg. per 100 ml).

2. Blood coagulation--Group A men exhibited an average blood clotting time of 6.9 minutes, Group B men an average time of 7.0 minutes, and Group C an average time of 7.4 minutes. The investigators describe the small difference as still significant.

3. Arcus senilis (abnormal cornea)--incidence was three times greater for Group A men than in Group B or Group C men.

4. Clinical coronary artery disease--28 percent of Group A men exhibited either clear-cut symptoms of definitive electrocardiographic signs of clinical coronary disease while only 4 percent Group B men and Group C men exhibited symptoms of coronary heart disease. The investigators concluded:

The results of this study strongly suggest that the behavior pattern exhibited by the men of Group A was of itself largely responsible not only for their higher serum cholesterol and possible hastening of clotting time, but also for their markedly increased incidence of both clinical coronary disease and arcus senilis [17:96].

Burnam, Pennebaker, and Glass (7:76) investigated behavioral consequences of the Type A behavior pattern. The authors hypothesized that since the Type A behavior pattern is characterized by an extreme sense of time urgency, Type A's would perform at maximum capacity even when a task lacks a specific deadline. In contrast, they hypothesized that the Type B person characterized by an "easy going" nature would vary their completion time based on changes in time allowed to complete a given task. Due to the time urgency of Type A's, it was also predicted that Type A's would report the lapse of one minute sooner than would Type B's.

Sixty-two students from the University of Texas participated in the study. Thirty-three were Type A's and twenty-nine were Type B's. In the first phase of the experiment, the subjects were asked to indicate the elapse of one minute while in the process of reading a passage aloud. In the second phase, the subjects were given 240 simple arithmetic problems to complete. Half the subjects were told that there was no time limit while the other half were told that they had five minutes to complete as many problems as they could.

The results for the first phase of the study showed that Type A's signaled the passage of one minute sooner than did Type B's (52.6 seconds for Type A's and 75.0 for Type B's). In the second phase (completion of arithmetic problems), it was shown that A's attempted more problems than B's (Type A's an average of 86; Type B's an average of 71.6), under the non-deadline conditions. Note that even though half of the subjects were told there was no deadline, they were interrupted after five minutes. Under the deadline condition, the difference between Type A's and Type B's was not significant with Type A's completing 87 and Type B's completing 94.5 ($P > .20$). Note that Type A subjects performed at almost an identical level under both circumstances while Type B subjects attempted more problems under deadline conditions than under no deadline conditions.

The concept of the Type A individual being of greater risk of heart disease is well accepted (3:665; 34:347). The characteristics of the Type A, especially the need for achievement, may lead the Type A individual to conditions of stress due to work overload.

Locus of Control. Three studies indicated a relationship between stress and locus of control (53:116; 2:446; 26:619). Internal locus of control refers to individuals who believe that reinforcements are contingent

upon their own behavior, capacities or attributes. External control refers to individuals who believe that reinforcements are not under their personal control but rather are under the control of powerful others, luck, chance, or fate (2:446).

Anderson (2:446) examined the relationship between managerial locus of control, perceived stress, coping behaviors, and performance. Ninety entrepreneurs participated in two data collection phases over a two and one-half year period following the effects of a major disaster (Hurricane Agnes). Since damage to local businesses was extensive it was assumed that this damage would contribute to abnormal stress levels in the subjects. Locus of control was measured on the basis of Rotter's twenty-nine-item I-E scale (45:1). Perceived stress was measured by questionnaire and coping behaviors were categorized into Class I and Class II. Class I coping responses were those aimed at dealing with the objective task situation involving problem-solving behaviors, such as obtaining resources to counter the initial loss. Class II coping behaviors were those which dealt with emotional or anxiety reactions including withdrawal, group affiliation, hostility and aggression. Organizational performance was defined as an effective organization based on returning to at least its former economic position before the onset of the flood in as short a time as possible.

Two data collection phases were utilized. At each phase, measurements of the variables described previously were obtained. Summary of the phases indicated that

. . . externals perceive higher stress than internals in a particular situation and that externals respond with much more defensiveness and much less task-oriented coping behavior than internals [3:446].

Schwartz (53:116) indicated that locus of control was a variable related to stress. However, the study did not specify the relationship.

Joe (26:619) reviewed the Internal-External control construct as a personality variable. In Joe's review of the literature relating the Internal-External construct to stress he concluded with the following summary:

The research suggests that externals described themselves as anxious, less able to show constructive responses in overcoming frustration, and more concerned with fear of failure than with achievement. Internals, on the other hand, describe themselves as more concerned with achievement and more constructive in overcoming frustration and less anxious [26:619].

In relation to the Internal-External locus of control construct, it might be revealing to examine the person-situation interaction. For example, would an internal locus of control individual perceive more stress in a job with low autonomy as opposed to a job with high autonomy?

Assertiveness. Assertiveness refers to the extent to which an individual outwardly responds to different confrontations in an appropriate, positive, self-confident

manner. Preliminary studies indicate that individuals with a high degree of assertiveness tend to cope better with stressful situations than do individuals with a low degree of assertiveness (57). This could be attributed to the fact that an assertive person will respond immediately to various stressors and not allow them to "accumulate" and possibly build up to such a degree as to cause him/her psychological and/or physiological harm.

Troxler (57) conducted a pilot study to examine the relationship between assertiveness and stress. The study included a small sample of approximately forty Department of Defense secretaries working in the San Antonio, Texas area. Assertiveness was measured by questionnaire while cortisol levels were used as an indicator of stress. Results indicated that secretaries who were more assertive had reduced levels of cortisol. Troxler believes that assertiveness is a moderating variable in relation to stress.

Personality Traits

Research has identified a relationship between certain personality traits and level of stress. Research also suggests that stress may be explained by the individual-environment interaction.

Marshall and Cooper (32) designed a research model to test their proposition that "stress is not a characteristic of either environment or individual but is the

outcome of the interaction of the two." Their independent variables, the potential causes of stress, were: (1) manager's individual demographics (measured by questionnaire); and (2) personality (measured by Cattell's 16PF), manager's career demographics (measured by questionnaire), job and organization characteristics (measured by questionnaire). Their dependent variables were manifestations of stress and included psychological ill health (Gurin's Psychosomatic Symptom List). In the first phase of their research data were collected between December 1974 and October 1975 from fifty-five senior managers of a multinational company and forty managers' wives. Information was gathered through interviews and was used for development of a second, quantitative phase of the study. In the second phase, a questionnaire package was circulated to 208 senior managers (wives were not included in this phase of the study). The questionnaire was designed to measure the independent and dependent variables mentioned earlier. The final response rate was 89 percent of 185 managers. This sample of senior male managers was subdivided by job function--research, production, service, marketing and engineering. They were also divided by managerial level--"lower," "intermediate," and "top." The managers were an average age of forty-seven. Marshall and Cooper (32) reported their results in two sections. The first contained the job factors that were reported as stressful and the second

reported personality profiles of the manager at risk of showing symptoms of stress. Since the emphasis of this paper is on personality, only results in section two will be reported. In section two, multivariate statistical techniques were used to relate the independent variables of the individual and the environment with the dependent variable stress. Analyses were given in three dimensions:

1. A sample as a whole
2. Within job function subgroups
3. Within managerial level subgroups

In the sample as a whole the manager with a "calculating" personality profile, achieving lower scores on the intelligence scale and in a position characterized by overload and lack of autonomy was at risk of showing psychological stress symptoms. The authors refer to the resemblance of these traits to Type A characteristics, a configuration of a striving individual who finds his ambitions thwarted. The authors also suggest that a sensitive, neurotic personality type is vulnerable in a wide range of stressful situations, both in and outside work.

In the job function analysis the results are as follows: (1) Managers in the Research Department, the authors summarize,

The research manager at risk of showing stress is older than others in the department but has less experience in terms of movement within the company.

His personality profile is that of an assertive, controlled self-sufficient individual who is possibly less bright than his colleagues [32].

(2) Managers on Production Sites--

The profile of the production manager likely to experience stress shows tendencies to be reserved and group-dependent, an individual who may be reluctant to assert himself in a difficult situation [32].

(3) Managers in Service Departments--"Personality characteristics which contribute to stress scores show a tendency to anxiety twinned with ambition [32]." (4) Managers in Marketing and Sales Department--"The marketing manager at risk of stress is very similar in character to his service department colleague showing evidence of being prone to anxiety in combination with ambition [32]."

Manager Level Analysis. (1) Lower Management-- the manager at risk of stress is ambitious, less bright personality type. Intermediate management-- personality profile of sensitive and ambitious. Top Management-- the manager at risk of stress and a personality of easily hurt feelings.

In conclusion, Marshall and Cooper state "We must conclude that stress is the outcome of the interaction of a particular point in time [32]." In support of this statement the following table gives a summary of the step-wise multiple regression analysis explanation of anxiety score for the sample as a whole and within subgroups. Note that the multiple R correlation between individual variables

and anxiety score are significantly higher when examined by subgroup.

<u>Description</u>	<u>Multiple R*</u>
Sample as a whole	.488
Managers in Research Department	.741
Managers on Production Sites	.741
Managers in Service Departments	.740
Managers in Marketing Departments	.631
Managers in Engineering Departments	.829
Lower Management	.526
Intermediate Management	.526
Top Management	.932

Cooper and Marshall (11) summarized six studies that utilized the MMPI in evaluating patients with coronary heart disease. The result of these six studies indicates that before their illness patients with coronary disease differ from persons who remain healthy on several MMPI scales, particularly those in the neurosis triad of hypochondriasis (HS), depression (D), and hysteria (Hy). There were also three studies summarized that used the 16 PF. All three studies report emotional instability and introversion in patients with coronary heart disease.

Paffenbarger, Wolf, and Notkin (38) related personality information on students with death certificates filed years later. Two of the precursors of fatal coronary heart disease were anxiety and neuroticism.

Personality Patterns Linked to Personality Traits

In examining the previous discussions concerning the relationship between Type A behavior pattern and stress

and the relationship between personality traits and stress, the question arises as to what personality traits relate to Type A behavior. The following studies examine this relationship.

Rosenmann, Rache, Borhani, and Feinlieb (44) investigated male minozygote (MZ) and dizygote (DZ) twins with an average age of forty-eight years to see if a relationship existed between Type A behavior and psychological tests. These subjects were given an interview for determining pattern A, along with the following battery of psychological tests: Thurstone Temperament Schedule (TTS); Gough 300 Adjective Checklist (ACL); the California Gough; Psychological Inventory (CPI); the MMPI; and the Cattell 16 PF Questionnaire. The results showed that four of the seven TSS scales correlated significantly ($P < .05$) with pattern A; Active ("Likes to be on the go"); Impulsive ("Likes to take chances and make decisions quickly"); Sociable ("Enjoys the company of others"). As for the ACL, ten adjective scales showed reliable correlations with the Type A behavior pattern. Only six of these exceeded a product-moment coefficient of ($R > .20$), including aggression (.28), exhibition (.27), self-confidence (-.25), and counseling readiness (-.27). None of the CPI scales, only one of the MMPI scales (worried breadwinner), and only two of the IGPF scales (imaginative

and relayed-tense) showed significant relations to the behavior pattern.

Glass (21) conducted a study to compare Type A behavior as measured by the Jenkins Activity Survey and objective measures of personality. The sample contained 275 male undergraduates. The tests administered were:

- (1) Rotters Internal-External Control (I-E) scale;
- (2) Taylor's Manifest Anxiety Scale; (3) the K and L scales of the MMPI; (4) the Need Achievement Subscale of the Edwards Personal Preference Schedule (EPPS);
- (5) Lykken's "Thrill-Seeking" Scale, which measures the extent to which an individual seeks out anxiety-arousing situations rather than equally unpleasant but distasteful situations; and (6) a test of Self Image called the TSBII.

The results of the study indicated only three product-moment coefficients of sizeable magnitude. Pattern A is positively related to self-esteem (.30), feelings of interpersonal dominance (.40), and self-confidence.

It is interesting to note that the personality traits that related to coronary heart disease (anxiety and neuroticism common to both of the studies) were not the same as those correlated to Type A individuals (self-esteem, dominance, and self-confidence) proposed to be more susceptible to coronary heart disease. This may be explained by suggesting that personality traits are

different from behavioral patterns. In fact, one author, Glass (21), suggests this very fact.

The notion of coronary prone behavior pattern is not quite the same as the idea of a coronary personality. The behavior pattern is a set of overt behaviors resulting from the interaction of a specific set of predispositions with appropriately eliciting situations [21].

He emphasizes that personality traits do not lead to behavioral and psychological responses by some invariant process.

Life Events

Events can happen in people's lives which are known to be stressful.

Field (14) conducted research to identify life events that correlated with depression, heart attack or serious illness. Based on this research, he assigned a point value to each event based on the relative predictive power of that event with regard to follow-on illness. The point values ranged from 11 for a traffic ticket to 100 for a death of a spouse. Statistics kept by Field indicated that 80 percent of all people who tallied 300 points or more in a single year would either become depressed, suffer a heart attack or suffer other serious illness. The five highest point values were associated with the following events:

Death of Spouse	100
Divorce	73
Marital Separation	65
Death of close family member	63
Personal injury or illness	53

Results of this study provide evidence that illness can be strongly associated with psychosomatic responses. How these psychosomatic responses affect physiological components such as cortisol and cholesterol would be of interest.

Cigarette Smoking

It is well known that cigarette smoking is associated with coronary heart disease (47:89). Smoking has also been known to increase cortisol levels (57).

Russek (47:89) examined the relationship between stress, tobacco and coronary disease. This study has already been described in detail under the heading of task characteristics. In relation to tobacco usage, Russek indicated that excessive smoking is widely recognized as being statistically correlated to coronary heart disease. He explains that "smoking may be only a symptom of the seemingly important etiologic factor, emotional stress [47:99]." This proposition is supported by his results which indicated that frequency of smoking increased in relation to advance in occupation-related emotional stress. Of interest, as indicated previously, is that those who never smoked had a higher incidence of heart disease (6.54 percent) than that of ex-smokers (2.34 percent).

Chaplan, Cobb, and French (9:211) examined the relationships of cessation of smoking with job stress, Type A/Type B behavior patterns and social support. The study included two hundred employees of the National Aeronautics and Space Administration. Questionnaires were administered that measured job stress, Type A/Type B behavior, social support and smoking behavior. Type A/Type B behavior was measured by a nine-item questionnaire with reliability of ($r = .80$). Subjective work load was used as an indication of stress. Subjective work load was measured based on a nine-item index with reliability of ($r = .87$). Social support was measured by a twenty-one-item index with reliability ($r = .91$) of support received from three types of role senders: immediate superior, work group or peers and subordinates. Smoking behavior was categorized by heavy and light and also categorized by (1) never smoked, (2) smoked, or (3) ex-smoker. The quit rate for smoking was computed as $100 \times (\text{ex-smokers}) / (\text{ex-smokers} + \text{smokers})$.

The results indicated that:

1. Smokers, compared to quitters had high scores on work load, responsibility, social support and Type A characteristics.
2. Smokers compared to ex-smokers had the highest scores on the Type A behavior pattern.

3. With regard to job stress, smokers reported more subjective work load than ex-smokers and spent a greater percentage of time under great to extreme deadline pressures.

4. Ex-smokers had less stress and less Type A personality characteristics than persons who have never smoked.

Based on the results of these two studies, evidence suggests that smoking may be a symptom of emotional stress and that emotional stress may be the causal factor in coronary heart disease. Also, studies that compare the incidences of heart disease among ex-smokers to that of nonsmokers might do well to include the Type A/Type B behavior pattern as a moderating variable.

Stressful Lifestyle

A stressful lifestyle has been indicated as a variable that is positively associated with heart attacks (29:166). Determining whether or not an individual has a stressful lifestyle is subjective and usually has to be related to the stress level the individual perceives. A stressful lifestyle may be explained in terms of many of the work environment facets and personal facets discussed previously.

Kringien (29:166) examined the relationship between heart attacks and heredity. The study consisted of pairs

of identical twins. Within each pair of twins one twin had experienced a heart attack, while the other was free from heart disease. Research was conducted to determine the reason why one twin had suffered a heart attack while the other was free of heart disease. The results of this research indicated that the key factor in explaining heart attack potential was stressful lifestyle. Twins who had suffered heart attacks indicated they had a much more stressful lifestyle than those twins absent of heart disease. This research is significant since it discounted the genetic factor often related to coronary heart disease.

Exercise

Many studies have examined the relationship between exercise and coronary heart disease. Review of this literature indicates that there is not a uniform opinion to whether exercise is beneficial or not beneficial in reducing incidence of coronary heart disease (15).

Fletcher and Cantwell (15) examine the effects of exercise on coronary risk factors based on review of current literature related to that subject. Below is a summary of their findings. A (+) was used to indicate beneficial effects of exercise, (NE) no effect, with (U) unrelated, and (IE) insufficient evidence to indicate a positive or negative effect.

Effects of Exercise on Coronary Risk Factors

<u>Risk Factor</u>	<u>Effect of Exercise</u>
1. Blood Lipids	
A. Cholesterol	IE
B. Triglycerides	BE
2. Blood Pressure	
A. Systolic	BE
B. Diastolic	BE
3. Cigarette Smoking	U
4. Blood Sugar	
A. Fasting blood sugar	BE
B. Glucose tolerance test	NE
5. Overweight	BE
6. Diet	U
7. Heredity	U
8. Personality and behavior patterns	IE

Demographics

Research has indicated the following demographics are related to stress.

Age. Brocher (4:26), Brook (5:22), and Switzer (56:237) indicate a curvilinear relationship between age and stress. Those in the ages from thirty-five to forty-five are more prone to succumb to stress because crucial changes to the individual's work role usually occur during this period.

Sex. Kannel and Gorden (27) show that serum cholesterol levels and their association to coronary heart disease is different for men and women. For men, there is

a strong association between high cholesterol and coronary heart disease between the ages of thirty-five and forty-four. The relationship diminishes with increasing age to the point that ages sixty-five to seventy-four no relationship is found. For women, the relationship between high cholesterol and coronary heart disease is strong before age forty-five which is suggestive of an age trend that parallels that of men. However, women at later ages sixty-five to seventy-four the relationship between high cholesterol and coronary heart disease was even stronger.

Kritchevsky, Paoletti and Holms (30) suggested a relationship between HDL (high density lipoproteins) cholesterol and coronary heart disease. Unlike total cholesterol which is believed to be positively associated with coronary heart disease, HDL cholesterol is believed to have an inverse relationship to coronary heart disease. Empirical evidence presented by Kritchevsky, Paoletti and Holms demonstrated that HDL-cholesterol levels are higher in women than in men, an observation that fits with women's lower rate of coronary heart disease.

Education. Shekelle (54) examined the relationship between coronary heart disease and education level. The population consisted of 270,000 Bell System men whose educational level was categorized as "no college" or "college." The results indicated that coronary heart

disease was more prevalent among "no college" men than among "college" men. In the ages of forty to forty-four, 22 percent of "no college" men showed evidence of coronary heart disease while only 9 percent of "college" men showed evidence of coronary heart disease.

Height/Weight. Kritchevsky, Paoletti and Holms (30) indicated an inverse relationship between body weight and HDL cholesterol.

Stress and Coronary Heart Disease
Related to Cholesterol, HDL
Cholesterol and Cortisol

The three physiological components of cholesterol, HDL cholesterol and cortisol have been linked to stress or coronary heart disease (8:181; 16:115; 455:183; 59:379; 6:956; 33:576; 30).

Brown, Schalch and Reichlin (6:956) examined cortisol responses to psychological stress in the squirrel monkey.

The study included twenty-nine male squirrel monkeys of the "Roman" phenotype. During the six-week period before the study the squirrel monkeys were wormed and observed for disease. The monkeys were then transferred to the laboratory where temperature, humidity and hours of illumination were controlled. Plasma cortisol was measured in the resting state and also under stress-induced conditions. Resting cortisol samples were

collected through a cannula, chronically implanted in the interior vena cava via the femoral vein, which led to the exterior of the cage. Induced stress consisted of the use of a restraining chair and avoidance conditioning (while the monkey was in the restraining chair) conducted by delivering electric shock through a shaved portion of the tail. For experiments in the restraining chair, the cannula was drawn out through the wall of an isolation box which prevented visual and auditory stimuli from reaching the animal.

Results indicated that plasma cortisol levels, after transfer to the restraining chair, were significantly higher than those of caged undisturbed monkeys. Plasma cortisol response to electrical shock did not show any further increase over cortisol levels obtained when the monkey was first placed in the restraining chair. The sole exception was the monkey which received the highest shock.

Peterson, Keith and Wilcox (40:798) examined the effects of the anticipation of stress on hourly changes in serum cholesterol.

Eight persons with the greatest serum cholesterol variation over five previous studies were chosen for this research. The subjects reported to a laboratory for three days where blood plasma was drawn hourly from 9:00 a.m. until 6:00 p.m. During the initial period at the

laboratory the subjects were given instruction concerning the general plan of the experiment. The subjects were told that days one and three were to serve as control days, and that on day two each subject would be exposed to a cold environment (0°C for thirty minutes). On day two, the subjects reported to the laboratory where they were reminded that later during the day each would be taken to a cold room for exposure. The remainder of the morning of the second day was planned to heighten anticipation as much as possible without indicating when the exposure to the cold room would begin.

At 2:00 p.m. subjects were taken in pairs to a cold room. As one subject was placed inside the room, the other was seated nearby to await his turn. After one person had been exposed to cold for thirty minutes, both subjects were taken to an adjacent room. On day three all subjects returned to the laboratory where hourly blood samples were again obtained.

Results showed that:

[1] Changes in serum cholesterol occurring on day 2 appear to relate more nearly to the announcement that experimental treatment was to begin than to the exposure itself [40:978].

[2] In most cases it was noted that a maximum concentration of serum cholesterol was encountered within 2 or 3 hours after the announcement regardless of the time at which the actual exposure occurred [40:978].

3. Hourly cholesterol patterns were the same between those exposed to cold and those who were not exposed.

4. Subjects showed significant changes in serum cholesterol within only a few hours.

In conclusion, the authors state that

. . . changes in the concentration of serum cholesterol may relate quite closely to the anticipation of a particular event as well as to the event itself. The occurrence of such a relationship does not establish cause and effect but it does point up how difficult it is to define a stressor event as to its composition, its timing and its significance to the subject [40:798].

Kritchevsky, Paoletti and Holms (30) examined the relationship between HDL cholesterol (high density lipoproteins) and risk of coronary heart disease. The evidence suggests that unlike conventional risk factors that confer increased risk of disease, HDL cholesterol appears to be a risk-lowering factor. This inverse relationship between HDL cholesterol and coronary heart disease has been consistent across six different populations. In every population sample the mean HDL cholesterol among coronary heart disease cases was lower than that among persons without disease. The Framingham study (27) also found that HDL cholesterol concentration was inversely related to the subsequent incidence of coronary heart disease in both men and women. One explanation of how increased HDL cholesterol might reduce risk of coronary heart disease is that

HDL may serve to transport cholesterol from the arterial wall cells to the liver for excretion (30).

Troxler (57) who is currently studying the relationship between stress and coronary heart disease at the Medical Research Center at Brooks Air Force Base, Texas, believes that a ratio of total cholesterol over HDL cholesterol is strongly related to risk of coronary heart disease. The higher the value resulting from dividing total cholesterol by HDL cholesterol, the greater the risk of coronary heart disease. This is consistent with other research previously discussed since a high ratio value would likely be the result of a high total cholesterol level and a low HDL cholesterol level, both believed to be positively related to CHD.

Wolf, McCabe, Yamamota, Adsett, and Schottstaedt (59:379) examined changes in serum lipids in relation to emotional stress during rigid control of diet and exercise. Their study included four subjects who were admitted to the metabolic ward of the Oklahoma Medical Research Foundation, who were maintained on balanced regimes for periods varying from four weeks to five months. Exercise was carefully regulated and maintained as uniform as possible. Three of the subjects had a well-documented myocardial infarction while the fourth had mild hypertention and hyperlipemia (excess lipids in the blood) which was assumed to be familial (existing in family members beyond chance).

During their stay the subjects had their cholesterol levels measured periodically throughout the day, and their activities monitored to isolate stressful situations. During the length of hospital stay, events supposed to be stressful were compared with the changes in levels of cholesterol.

The results showed an increase of cholesterol associated with stressful events. For example, during a stressful interview a patient's cholesterol increased over 70 mg. within an hour. During another episode when a patient was called a derogatory name, a fight was prevented only by the intervention of the nursing personnel. Blood cholesterol drawn soon after the encounter proved to be the highest observed during the patient's stay. Wolf et al. conclude "that the mechanisms that govern the serum concentration of certain lipids are connected with and capable of responding to impulses from the higher centers of the brain [59:379]."

Mason (33:576) reviewed psychoendocrine research on the pituitary-adrenal cortical system. In the summary section of his analysis he commented:

[1] Massive evidence has now accumulated which indicates that the pituitary adrenal cortical system responds sensitively to psychological influences [33:576].

[2] Psychological factors may either raise or lower the level of pituitary-adrenal cortical activity. Some important variables to consider in relation to the

direction of 17-OHCS response are the quality of the emotional reaction, the style and effectiveness of psychological defenses and whether the threat is of an acute or chronic nature [33:576].

Chaplan, Cobb and French examined the relationship between white-collar work load and cortisol. This study was discussed in detail under the heading of Work Load/Time Pressure. Of importance in this study was the effect subjective work load plays on the circadian (daily cycle) of cortisol. Individuals reporting high work loads had lower cortisol levels than low work load individuals which suggests that chronic stress as opposed to acute stress decreases cortisol levels. This is consistent with the concluding remarks made by Mason (33:576).

Studies by Sales (49:324) and Friedman, Rosenmann and Carroll (18:85) showed a positive relationship between cholesterol and stress. These studies were previously discussed within the job environment facets.

It can be concluded that psychological stress affects the physiological components of cholesterol, HDL cholesterol and cortisol. The literature suggests the following relationships between cholesterol, HDL cholesterol and psychological stress.

Increased Stress → Increased Cholesterol

→ Increased CHD

Increased HDL Cholesterol → Decreased CHD

The literature suggests that the direction of the relationship between cortisol and stress may be dependent on whether chronic or acute stress is present. The relationship may be as follows:

Chronic Stress → Decreased Cortisol

Acute Stress → Increased Cortisol

CHAPTER III

METHODOLOGY

The objective of this research was to examine the relationships of job environment facets and personal facets with respect to physiological components and perceived stress. Job environment facets, personal facets and perceived stress were measured by a questionnaire referred to as the Stress Assessment Package (SAP). The physiological components, measured through blood analysis, included total cholesterol, HDL cholesterol, cortisol and a ratio of total cholesterol over HDL cholesterol. The relationships between the independent variables (job environment facets and personal facets) and the dependent variables (physiological components and perceived stress) were computed by multivariate techniques. Specific details concerning questionnaire development, blood analysis, questionnaire administration and statistical analyses are as follows:

Questionnaire Development

A 139-item questionnaire was developed to measure job environment facets, personal facets and perceived stress. This questionnaire is contained in Appendix A. Specific components and explanation of their development is as follows:

<u>Job Environment Facets</u>	<u>No. of Questions</u>
1 General Organizational Climate	5
2 Role Ambiguity	3
3 Role Conflict	5
4 Policies and Regulations	2
5 Organizational Communications Climate	2
6 Productivity	4
7 Job Related Satisfaction	10
8 Job Enhancement	5
9 Autonomy	2
10 Planning and Time Management	3
11 Goals	7
12 Advancement/Recognition	4
13 Meaningful/Responsible Work	3
14 Management/Supervision	6
15 Supervisor Asst./Feedback	3
16 Workload/Time Pressure	3
17 Responsibility for People	1
18 Co-worker Relations	2
19 Change in Work Responsibilities	1
20 Equipment Limitations	1
21 Does Supervisor Write Performance Report	1
22 Number of Co-workers	1
23 Regularity of Work Hours	1
24 Communication Between Co-workers	1
25 Goal Participation	1
26 Work Schedule	1
27 Career Employment Intentions	1
28 Number of People Supervised	1
29 Job Tenure	2
30 Person/Role Congruence	7
Total	<u>89</u>

Measurements for Job Environment Facets 1-18 were abstracted from the Organizational Assessment Package which was developed for the Leadership and Management Development Center by Hendrix and Halverson (22). The scales taken from the Organizational Assessment Package were abbreviated by selecting those questions within a scale that produced the highest factor loadings. Questions 19-30 were developed by this thesis team in order

to capture additional job environment information believed to have a relationship to stress.

In addition, certain variables were computed using job environment questions to make two transgenerated variables called Job Motivation Index (JMI) and the Need for Enrichment Index (NEI). Computation of the transgenerated variables as well as the identification of questions used to measure specific job environment facets are contained in Appendix A.

Personal Facets	Number of Questions
1 Locus of Control	11
2 Type A/Type B	12
3 Assertiveness	7
4 Life Events	1
5 Exercise	2
6 Medication Usage	1
7 Smoking Habits	2
8 Rank (officer, enlisted, GS, WG, Non-DOD)	5
9 Race	1
10 Sex	1
11 Weight/Height	2
12 Age	1
13 Education	1
14 Professional Military Education	1
Total	48

Facet 1. Locus of Control was measured by eleven questions designed to determine to what extent an individual was either an internal or external locus of control type person. This scale was based on Rotter's (45:20) original twenty-nine item questionnaire I/E scale as modified by Valencha (58:6) to an eleven-item scale. Valecha's

modified scale of internal/external locus of control was used with modification from four gradients of internal/external locus of control to six gradients.

Facet 2. Type A/Type B behavior pattern was measured by twelve questions developed by this thesis team based on the attributes known to be associated with the Type A/Type B behavior pattern (10:715; 17:100; 43:15).

Facet 3. An assertiveness scale was developed by this thesis team by utilizing questions believed to measure the degree of assertiveness such as "To what extent do you call attention to the situation in which a late comer is waited on before you?"; "To what extent are you able to speak up for your viewpoint when you differ with a person you respect?"

Facet 4. Life Event items were developed based on life events suggested by Field (14:87) to be the most stressful. Participants were asked if they had experienced one or more (the exact number specified) of the following within the last year: (1) death of your spouse, (2) divorce, (3) marital separation, (4) death of a close family member, or (5) serious injury.

Facet 5. Exercise was measured on the regularity of physical exercise in general plus a specific question for joggers concerning the number of miles jogged per week.

Facet 6. Medication usage was designed to identify medication usage of each participant for the purpose of identifying participants whose blood chemistry might be altered.

Facet 7. Smoking habits measured the daily usage of tobacco by cigarette smokers, pipe smokers, and cigar smokers.

Facets 8-14. These included selected demographics that this thesis team felt might act as moderating variables in relation to stress and coronary heart disease.

Identification of questions used to measure specific personal facets are contained in Appendix A.

Perceived Stress

These questions captured the respondent's perception of his/her level of stress experienced outside the job environment and for stress experienced in the job environment based on the following two statements:

1. "Your lifestyle away from your job is extremely tense and stressful." Responses were available in seven gradients from "not at all" to "to a very great extent."

2. "My job causes me a great deal of stress and anxiety." Responses were available in seven gradients from "strongly disagree" to "strongly agree."

Blood Analysis

All blood samples were sent to USAF School of Aerospace Medicine (USAFSAM/NPG), Brooks Air Force Base, Texas for analysis due to their ability to provide superior quality control. Blood plasma was analyzed for total cholesterol, HDL cholesterol, and cortisol. Plasma cholesterol was analyzed by an enzymatic method using BMC autoflo cholesterol reagents (catalogue number 14893, biodynamics/bmc, Indianapolis, Indiana 46250) and ABA-100 bichromatic analyzer (Abbott Laboratories, North Chicago, Illinois 60064). Standards were prepared and checked against lipid standards provided by the National Bureau of Standards and the Center for Communicable Diseases. Between-day coefficient of variations for cholesterol method were held at 2.5 percent or less. HDL cholesterol was determined by the above enzymatic method or the serum supernatant after phosphotungstic acid precipitation with coefficients of variations held to 1.0 percent or less.

Plasma cortisol was obtained from 0915-0945 hours. Collection of cortisol was restricted to this half hour time interval due to the need to control for the diurnal pattern of cortisol. Wake-up times for participants were recorded for 21 percent of the 351 participants for which cortisol levels were obtained. The mean wake-up time was 0534 with a standard deviation of twenty-seven minutes. Although wake-up time would influence the level of cortisol

measured from 0915-0945, the influence was considered not to be significant based on the small variation in wake-up times. Cortisol concentrations were determined by the Gamma Coat Cortisol RIA technique (Clinical Assays Catalogue numbers CA-529, 549, Cambridge Massachusetts 02139).

Questionnaire Administration

Questionnaires were administered to 372 participants as follows:

Eglin AFB, Florida	203
Wright-Patterson AFB, Ohio	93
Headquarters, Air Force Commissary Service, Kelly AFB, Texas	37
Metropolitan Hospital, San Antonio, Texas	24
Reese AFB, Texas	15
Total	372

Of the 372 questionnaires, nine questions were not usable. The questionnaires were administered in conjunction with stress seminars except at Reese AFB where questionnaires were mailed for administration. The seminar procedure followed was:

Introduction	0850-0915
Blood drawn	0915-0945
Questionnaire completion	0945-1100
Lunch break	1100-1300
Selected feedback and film or live presentation	1300-1530

Blood samples were drawn in conjunction with all the seminars, with the exception of Reese AFB, and a total of 351 samples were available for statistical analyses.

In summary, the data available for analysis included 363 questionnaires and 351 blood analyses that included measures of cholesterol, HDL cholesterol, and cortisol. In addition, the cholesterol/HDL cholesterol ratio was calculated for the 351 participants with blood chemistry data.

Statistical Procedures

Factor analysis was conducted on 363 questionnaires to determine factors suitable for follow-on regression analyses. The factor analyses included an orthogonal rotation (Varimax) without physiological components and demographics and an oblique rotation with the same omissions as those in the orthogonal rotation.

In the regression analyses, the population was somewhat different from the one used in the factor analysis. For this population, three criteria were applied: (1) Did the respondent have an unusable questionnaire response? (2) Did the respondent have an incomplete blood chemistry analysis? (3) Was the subject taking any medication that could have affected blood chemistry analysis? If the answer to any of the above questions was yes, then that case was eliminated from the sample used in the regression analyses. After the criteria were applied, there remained 203 cases that were suitable for regression. Using this revised sample, the factors identified through factor

analysis were used as independent variables in step-wise multiple regression against the following nine dependent variables:

1. Total Cholesterol
2. HDL Cholesterol
3. Cortisol
4. Ratio of Total Cholesterol/HDL Cholesterol
5. Total Cholesterol * HDL Cholesterol
6. Perceived Job Stress
7. Perceived External Stress (Outside Job Environment)
8. Response to Perceived Job Stress (+) Response to Perceived External Stress
9. Response to Perceived Job Stress (*) Response to Perceived External Stress

In addition to the above-mentioned regressions that utilized the factor scores found in the factor analysis, other step-wise regressions were accomplished. In these latter regressions, an attempt was made to capture the relationship of selected independent variables that did not contribute to a "factor score," to the following dependent variables:

1. Total Cholesterol
2. HDL Cholesterol
3. Cortisol
4. Ratio of Total Cholesterol/HDL Cholesterol
5. Total Cholesterol * HDL Cholesterol
6. Perceived Job Stress
7. Perceived External Stress (Outside Job Environment)
8. Response to Perceived Job Stress (+) Response to Perceived External Stress
9. Response to Perceived Job Stress (*) Response to Perceived External Stress

The selected independent variables used in the regressions included the following: (Please refer to Appendix A to reference question numbers.)

Job Inventory. Questions 30, 33, 35, 36, 37, 40, 41, 42, 43, 44, 51, 52.

Organization Climate Inventory. Questions 71, 76, 78, 79, 80, 83, 88, 89, 91, 93.

Job Satisfaction. Questions 96, 97, 98, 100, 101.

Demographics. Grade Level, Experience in Present Job, Race, Weight, Height, Age, Smoking, Exercise, Educational Level, Career Intentions.

The results of the factor analysis and the regressions are discussed in the analysis section.

CHAPTER IV

ANALYSIS

The purpose of the analysis section is to discuss the results from the factor analysis of the Stress Assessment Package, the results of the reliability of the various scales identified in the factor analysis, and the results of the regression of factor scores and other selected variables on the dependent variables. The reliabilities of the scales were computed using Cronbach's Alpha coefficient.

Factor Analysis and Reliability

The factor analysis on the Stress Assessment Package yielded eighteen factors. The criteria for selection of factors was that there must be at least two variables loading on a factor with each variable having a factor loading greater than 0.5.

Factor 1. *Job Satisfaction.* There were twelve variables loading on this factor. The variables revealed job satisfaction facets such as: (1) overall feelings concerning the job, (2) the amount of pride in the job, (3) amount of task variety, (4) the extent to which the job is in line with interests and values, (5) the extent that the job fulfills expectations, (6) feeling of

helpfulness to other people through the job, (7) family attitude toward job, and (8) the extent that valuable skills are acquired in the job. The reliability of this scale was $\text{Alpha} = 0.90530$.

Factor 2. *Supervision.* There were nine variables loading on this factor. This factor refers to what extent the supervisor: (1) is a good planner, (2) represents the group, (3) establishes good work procedures, (4) makes responsibilities clear to the group, (5) performs well under pressure, (6) helps to improve performance, and (7) provides feedback helpful to increased job performance. The reliability of this scale was $\text{Alpha} = 0.92$.

Factor 3. *Assertiveness.* There were six variables loading on this factor. This factor refers to the extent to which an individual outwardly responds to different confrontations in an appropriate, positive, self-confident manner. The variables examined to what extent an individual would: (1) call it to someone's attention when that person is being unfair, (2) speak out in protest when someone takes his/her place in line, (3) call it to someone's attention that they are kicking his/her chair in a movie, (4) insist that his/her landlord make repairs that are the landlord's responsibility to make, (5) speak up for his/her viewpoint when they differ with a person that he/she respects, and (6) refuse unreasonable requests

made by friends. The reliability of this scale was Alpha = 0.82.

Factor 4. Productivity. There were five variables which loaded on this factor. This factor examined to what degree: (1) there is high quality output of the work group, (2) an outstanding job is done under pressure situations, (3) the performance of individual's work group is very high in comparison to similar work groups, and (4) the quantity of work of the work group is very high. The reliability of this scale was Alpha = 0.91.

Factor 5. Internal/External Locus of Control. There were six variables loading on this factor. Internal locus of control refers to individuals who believe that reinforcements are contingent upon their own behavior, capacities or attributes. External locus of control refers to individuals who believe that reinforcements are not under their personal control but rather are under the control of powerful others, luck, chance, or fate. The variables that loaded on this factor examined to what degree: (1) the individual felt that becoming a success was a matter of hard work as opposed to success being dependent on being at the right place at the right time, (2) getting what you want has little or nothing to do with luck as opposed to getting what you want depending on ability, and (3) what happens to a person is his own doing as opposed to feeling that there is little an individual

can do to control his own life. The reliability of this scale was Alpha = 0.73.

Factor 6. *Organizational Climate.* There were three variables loading on this factor. The variables portraying job climate examined to what degree: (1) the organization is interested in the attitudes of the group members toward their jobs, (2) the organization has a strong interest in the welfare of its people, and (3) the organization rewards individuals based on performance. The reliability of this scale was Alpha = 0.84.

Factor 7. *Need for Enrichment.* There were three variables loading on this factor. The variables examined to what extent the individual: (1) would like to have the opportunity to perform a variety of skills in his/her job, (2) would like to have the opportunity for personal growth in his/her job, and (3) would like to have the opportunity to use his/her skills in the job. The reliability of this scale was Alpha = 0.83.

Factor 8. *Type A/Type B Behavior Pattern.* There were three variables loading on this factor. Type A behavior is characterized by a chronic sense of time urgency, a hard driving and competitive orientation, a distaste for idleness, and chronic impatience. The Type B behavior is characterized by the opposite traits, i.e., more easy going, able to relax, and not feeling the time urgency pressure. The variables that loaded examined to

what degree: (1) the individual protested waiting on anything or anybody, (2) the individual felt a sense of time urgency, and (3) the individual set high work standards. The reliability of this scale was $\text{Alpha} = 0.66$.

Factor 9. *Time adequacy.* There were two variables loading on this factor. The variables examined to what degree: (1) the individual felt he/she could produce a higher quality product, if more time was available, and (2) the individual felt that there was never enough time to adequately complete assigned tasks. The reliability of this scale was $\text{Alpha} = 0.71$.

Factor 10. *Rules and Regulations.* There were four variables loading on this factor. This factor examined the degree that: (1) there were too many policies and regulations, (2) the individual could do a better job with fewer rules, (3) things should be done differently, and (4) the requirement to do unnecessary things. The reliability of this scale is $\text{Alpha} = 0.82$.

Factor 11. *Goal Clarity.* There were three variables loading on this factor which examined to what extent the individual: (1) felt his job performance goals were clear and specific, (2) felt that his job provided the chance to know for himself when he did a good job and allowed him to be responsible for his own work, and (3) knew exactly what was expected of him in performing his job. The reliability of this scale was $\text{Alpha} = 0.77$.

Factor 12. *Job Autonomy.* There were two variables loading on this factor. These variables examined to what extent the individual felt: (1) that the job provided a great deal of freedom and independence in scheduling work and selecting procedures to accomplish a task, and (2) the job gave the freedom to do work as the individual saw fit. The reliability of this scale was Alpha = 0.90.

Factor 13. *Job Importance.* There were two variables loading on this factor which examined to what extent the individual felt: (1) that the job provided a feeling of pride and self-worth, and (2) that doing his/her job well would affect a lot of people. The reliability of this scale was Alpha = 0.90.

Factor 14. *Goal Setting.* There was one variable loading on this factor which examined to what extent the work group was involved in establishing goals. The dangers, with respect to reliability, of a one-item scale were noted. It was felt, however, that Goal Setting was another dimension that was necessary to keep as an independent variable. Alpha = 1.0.

Factor 15. *Availability of Time to Plan.* There were two variables loading on this factor which examined to what extent the individual: (1) used their time for weekly or monthly planning, and (2) used their time for

daily planning. The reliability of this scale was Alpha = 0.76.

Factor 16. *Role Conflict.* There were two variables loading on this factor which examined to what degree the individual felt that: (1) he/she was instructed to do their job in different ways by different people, and (2) he/she could not please one superior without displeasing another. The reliability of this scale was Alpha = 0.77.

Factor 17. *Work Information.* There were two variables loading on this factor which examined to what extent: (1) the organization provided all the necessary information for a person to do his work effectively, and (2) the organization provided adequate and accurate information to their work group. The reliability of this scale was Alpha = 0.84.

Factor 18. *Intergroup Conflict.* There were two variables loading on this factor which examined to what extent: (1) there was conflict between the individual's work group and another work group in the organization, and (2) there was conflict between the individual's organization with which the individual had some work-related dealings. The reliability of this scale was Alpha = 0.71.

Multiple Regression Analysis

In this section, each research question will be systematically addressed. For each case, the regression results for the factor scores will be presented as will the results of the regressions involving the other selected independent variables. Throughout these procedures, the significance level of the step-wise regressions was controlled at $\alpha = 0.10$. The coefficient of multiple correlation (R) and the coefficient of multiple determination (R^2), will be shown for each factor or variable entering the regression equation and the variables will be presented in the order they entered the equation. That is, as each variable is entered into the equation, it will contain its variance, plus the variance of the variables already in the equation. A factor or variable by itself might in fact be predictive of a dependent variable. However, since other factors or variables were more predictive, the additional factor or variable might not be included in the regression equation because it did not add anything to the predictability above and beyond that contributed by the original variables already included in the regression equation. When the regressions involving the other selected independent variables are presented, a form of shorthand notation will be used. This notation will use a V followed by a number. The number corresponds to the question numbers in the Stress Assessment Package.

Example: V122 asks the age of the respondent. A summary of the regression equations is presented in Appendix B.

Research Question 1-A. *What organizational and individual factors are predictive of cortisol level?*

In the factor score regression analysis, three factors were found to be significantly predictive.

Factor	Label	R	R ²
14	Goal Setting	0.133	0.018
6	Organizational Climate	0.172	0.030
5	Locus of Control	0.199	0.040

In the regression analysis utilizing the other selected independent variables, ten were found to be predictive of cortisol level.

Variable	Label	R	R ²
V126	Traumatic Life Events	0.231	0.053
V 30	Long Range Planning	0.310	0.096
V 89	Acceptable Tasks	0.343	0.117
V117	Job Experience	0.365	0.133
V122	Age	0.386	0.149
V128	Education Level	0.401	0.161
V136	Group Meetings	0.416	0.173
V131	Number Supervised	0.437	0.191
V 43	Change in Responsibility	0.453	0.205
V129	Jogging	0.468	0.219

Research Question 1-B. *What organizational and individual factors are predictive of perceived job stress?*

In the factor score regression analysis, seven factors were found to be predictive of perceived job stress.

Factor	Label	R	R ²
8	Type A/B Behavior	0.199	0.040
18	Inter-group Conflict	0.274	0.075
5	Locus of Control	0.322	0.104
16	Role Conflict	0.353	0.125
1	Job Satisfaction	0.376	0.142
14	Goal Setting	0.399	0.159
6	Organizational Climate	0.417	0.174

In the regression analysis utilizing the other selected independent variables, thirteen were discovered.

Variable	Label	R	R ²
V 93	Inadequate Material	0.445	0.198
V114	Wage Grade Level	0.481	0.231
V129	Jogging	0.509	0.259
V101	Job Security	0.535	0.286
V 71	Quantity of Output	0.553	0.305
V136	Group Meetings	0.569	0.324
V 52	Responsibility for your Own Work	0.580	0.336
V111	Officer Grade Level	0.596	0.355
V120	Weight	0.609	0.371
V 89	Acceptable Tasks	0.617	0.381
V 44	Adequate Equipment	0.625	0.390
V135	Communication	0.632	0.399
V115	Non-DOD Civilian Job Position	0.638	0.407

Research Question 1-C. *What organizational and individual factors are predictive of perceived external (non-job) stress?*

In the regression analysis using the factor scores, seven factors were found to be predictive of external stress.

Factor	Label	R	R ²
8	Type A/B Behavior	0.260	0.067
7	Need for Enrichment	0.291	0.084
11	Goal Clarity	0.315	0.099
3	Assertiveness	0.340	0.115
16	Role Conflict	0.356	0.127
4	Productivity	0.369	0.136
1	Job Satisfaction	0.379	0.144

In the regression analysis utilizing the selected independent variables, nine were discovered to be predictive.

Variable	Label	R	R ²
V126	Traumatic Life Events	0.264	0.070
V 88	Job Stress	0.324	0.105
V135	Communication	0.380	0.144
V112	Enlisted Grade Level	0.412	0.170
V 41	Chance to Finish Work	0.435	0.189
V111	Officer Grade Level	0.452	0.204
V120	Weight	0.466	0.217
V129	Jogging	0.478	0.228
V 43	Change in Work Responsibilities	0.490	0.240

Research Question 1-D. *What organizational and individual factors are predictive of perceived cumulative stress [response to job stress (+) response to external stress]?*

In the factor score regression analysis, twelve factors were found to be predictive of this transgenerated variable.

Factor	Label	R	R ²
8	Type A/B Behavior	0.281	0.079
5	Locus of Control	0.331	0.110
16	Role Conflict	0.367	0.135
18	Inter-Group Conflict	0.400	0.160
1	Job Satisfaction	0.422	0.178
6	Organizational Climate	0.439	0.193
7	Need for Enrichment	0.453	0.205
14	Goal Setting	0.465	0.216
15	Availability of Time to Plan	0.476	0.227
2	Supervision	0.484	0.235
13	Job Importance	0.492	0.242
9	Time Adequacy	0.499	0.249

In the regression analysis using the selected variables, thirteen were found to be predictive of cumulative stress.

Variable	Label	R	R ²
V 93	Inadequate Material	0.384	0.147
V129	Jogging	0.434	0.188
V126	Traumatic Life Events	0.465	0.216
V 71	Quantity of Output	0.498	0.248
V 52	Responsibility for Own Work	0.514	0.264
V101	Job Security	0.530	0.281
V114	Wage Grade Level	0.544	0.295
V115	Non-DOD Civilian Job Level	0.557	0.311
V 43	Change in Work Responsibilities	0.567	0.322
V138	Career Intentions	0.577	0.333
V 36	Preparation for Increased Responsibilities	0.586	0.343
V136	Group Meetings	0.595	0.354
V 30	Long-Range Planning	0.606	0.368

Research Question 1-E. *What organizational and individual factors are predictive of perceived multiplicative stress [response to job stress (*) response to external stress]?*

In the factor score regression analysis, twelve factors led to the predictive equation for multiplicative stress.

Factor	Label	R	R ²
8	Type A/B Behavior	0.244	0.059
1	Job Satisfaction	0.303	0.092
7	Need for Enrichment	0.347	0.121
18	Intergroup Conflict	0.379	0.144
16	Role Conflict	0.407	0.166
5	Locus of Control	0.428	0.183
14	Goal Setting	0.446	0.199
15	Availability of Time to Plan	0.464	0.216
11	Goal Clarity	0.473	0.224
3	Assertiveness	0.480	0.230
6	Organizational Climate	0.487	0.238
2	Supervision	0.494	0.244

In the regression analysis utilizing the selected variables, eleven variables were found to be predictive.

Variable	Label	R	R ²
V 93	Inadequate Material	0.312	0.097
V129	Jogging	0.386	0.149
V 76	Motivation	0.421	0.177
V115	Non-DOD Civilian Job Level	0.445	0.198
V114	Wage Grade Level	0.466	0.217
V 43	Change in Work Responsibilities	0.485	0.235
V 71	Quantity	0.497	0.247
V126	Traumatic Life Events	0.513	0.263
V 52	Responsibility for Your Own Work	0.525	0.275
V136	Group Meetings	0.535	0.287
V 30	Long Range Planning	0.547	0.300

Research Question 2-A. *What organizational and individual factors are predictive of cholesterol level?*

In the factor score regression analysis, inter-group conflict was the only factor found to be a

significant predictor of the total cholesterol level.

Factor	Label	R	R ²
18	Intergroup Conflict	0.168	0.028

In the regression analysis using the other selected variables, five variables were discovered to be predictive of the total cholesterol level.

Variable	Label	R	R ²
V122	Age	0.228	0.052
V 35	Career Progression Opportunity	0.288	0.083
V136	Group Meetings	0.327	0.107
V 98	Communication	0.355	0.126
V116	Job Tenure	0.375	0.141

Research Question 2-B. *What organizational and individual factors are predictive of HDL cholesterol level?*

In the factor score regression analysis, two factors were found to be predictive of HDL cholesterol.

Factor	Label	R	R ²
6	Organizational Climate	0.119	0.014
17	Work Information	0.178	0.032

In the regression analysis using the selected variables, nine predictive variables were found.

Variable	Label	R	R ²
V120	Weight	0.426	0.182
V129	Jogging	0.443	0.196
V111	Officer Grade Level	0.466	0.217
V117	Experience in Present Job	0.486	0.236
V126	Traumatic Life Events	0.505	0.255
V 76	Motivation	0.530	0.281
V 33	Awareness of Promotion Opportunities	0.542	0.294
V112	Enlisted Grade Level	0.553	0.306
V 51	Clear Goals	0.562	0.316

Research Question 2C. *What organizational and individual factors are predictive of the total cholesterol/HDL cholesterol Ratio [Measure of Total Cholesterol (÷) Measure of HDL Cholesterol]?*

In the regression analysis utilizing the factor scores, four factors were found to be predictive of this ratio.

Factor	Label	R	R ²
1	Job Satisfaction	0.126	0.016
17	Work Information	0.179	0.032
10	Rules and Regulations	0.214	0.046
6	Organizational Climate	0.236	0.056

In the regression analysis using the other selected variables, fourteen variables were discovered to be predictive of this ratio.

Variable	Label	R	R ²
V120	Weight	0.375	0.141
V116	Job Tenure	0.439	0.193
V126	Traumatic Life Events	0.469	0.220
V129	Jogging	0.505	0.255
V111	Officer Grade Level	0.525	0.276
V118	Race	0.541	0.292
V 97	Self-improvement Opportunities	0.553	0.306
V 98	Communication	0.567	0.322
V 37	Receiving Recognition	0.580	0.336
V 43	Change in Work Responsibilities	0.590	0.348
V112	Enlisted Grade Level	0.597	0.357
V101	Job Security	0.605	0.366
V 40	Realistic Goals	0.612	0.374
V 78	Knowledge of Role in Organization	0.618	0.382

Research Question 2-D. *What organizational and individual factors are predictive of total cholesterol (*) cortisol?*

In the factor score regression analysis, four factors were found to be predictive of this transgenerated variable.

Factor	Label	R	R ²
14	Goal Setting	0.149	0.022
18	Intergroup Conflict	0.188	0.035
13	Job Importance	0.219	0.048
6	Organizational Climate	0.239	0.057

In the regression analysis utilizing the selected independent variables, seven variables were found to be predictive.

Variable	Label	R	R ²
V126	Traumatic Life Events	0.185	0.034
V 89	Acceptable Tasks	0.270	0.073
V 30	Long Range Planning	0.310	0.096
V117	Experience in Present Job	0.339	0.115
V136	Group Meetings	0.363	0.132
V115	Non-DOD Civilian Job Level	0.382	0.146
V131	Number of Employees	0.402	0.161

CHAPTER V

CONCLUSIONS

It is important to recapitulate at this point that the purpose of this research was twofold. First, an attempt was made to identify organizational and individual factors that were predictive of stress. Second, the research sought to identify those organizational and individual components that were predictive of coronary heart disease (CHD) potential. Nine specific research questions were used as the framework in finding these components; five indicating stress predictors and four indicating CHD predictors. It is noteworthy to mention those factors/variables that predicted neither stress nor CHD potential.

Job autonomy was the only factor that predicted neither. Intuitively, it would be suspected that a low degree of autonomy would cause a great deal of job stress for a person that did not wish to be so tightly controlled in his/her job environment. This did not prove to be true in our sample.

Of the selected variables (those not contributing to factor scores) that were used in the analysis, sixteen were not predictive of either stress or CHD potential. As mentioned previously, these might correlate with the

criteria but not add to the prediction equation above and beyond that of the other predictor variables. They are as follows:

<u>Question Number</u>	<u>Description</u>
42	People depending upon the individual
79,80	Role ambiguity; not sure of your purpose in the organization
83	Individual's needs in conflict with those of organization
91	Inadequate manpower to accomplish task
96	Moral acceptability of job
100,134,137	Work schedule
113	General schedule grade level
121	Height
123,124	Smoking
125	Physical exercise (excluding jogging)
130	Level of professional military education completed
133	Number of co-workers

Of these variables, possibly the most surprising were inadequate manpower to complete the task, smoking and physical exercise.

The respondents' stress level was not increased when they were faced with a shortage of manpower or, the converse, they never experienced such shortages. The variables of smoking and physical exercise were surprising in that they did not support previous research (refer to literature review). Smoking has been linked to CHD through

numerous studies, but such a relationship did not exist in our research. A possible explanation is that this study used the predictive properties of total cholesterol, HDL cholesterol, their ratio, and their multiplicative product, and that these variables were not sufficient to cause a correlation with the use of tobacco. In terms of the exercise variable, it is interesting to note that while this particular question had no predictive properties, the question concerning jogging proved to be a predictor for both stress (negative relationship) and CHD (negative relationship). This stemmed from the fact that the respondents appeared to make a strong distinction between general exercise and the specific activity of jogging.

The remainder of this chapter will be subdivided into two sections: predictors of stress and predictors of coronary heart disease potential. Only the most prominent predictors will be presented. For a detailed look at the relationships, please refer to summary Table 1.

Independent Variables as Predictors of Stress

Job Satisfaction

This factor was negatively related to job stress, external stress, cumulative stress (job stress (+) external stress) and multiplicative stress (job stress (*) external stress). These findings are consistent with previous research which has indicated that as job satisfaction

TABLE 1--Continued

	Job Satisfaction	Supervision	Assertiveness	Productivity	External Locus of Control	Internal Locus of Control	Organization of Control	Climate	Need for Enrichment	Type A Behavior	Type B Behavior	Time Adequacy	Rules/Regulations	Goal Clarity	Autonomy	Job Importance	Goal Setting	Availability of Time to Plan	Role Conflict	Work Information	Intergroup Conflict
<u>INDICATORS FOR STRESS</u>																					
Cortisol					N	P	P	P									P		P		
Job Stress	N				P	N	N	N		P	N						P		P		
External Stress	N		N	N					P	P	N			N							
Cumulative Stress	N	N			P	N	N	N	P	P	N	P				P	P	N	P		P
Multiplicative Stress	N	N	N		P	N	N	N	P	P	N			N			P	N	P		P
<u>INDICATORS FOR CHD POTENTIAL</u>																					
Total Cholesterol																					N
HDL Cholesterol							P	P												N	
Ratio	P						N	N					P							P	
Total Cholesterol x Cortisol							P	P								P	P				N

☐ N = Negative Relationship;
 ☐ P = Positive Relationship;
 ☐ = No Relationship.

increased occupational stress and external stress decreased (19:594; 24:272; 48:266; 50:861).

Supervision

This factor was negatively related to cumulative stress and to multiplicative stress. Consequently, as the quality of supervision improved, the lower the level of cumulative and multiplicative stress experienced by the employee.

Assertiveness

This factor was negatively related to external stress and to multiplicative stress. As the individual increased in his assertiveness level, the amount of perceived stress decreased. Interestingly, assertiveness was not significantly related to perceived job stress. Possibly within the military environment, the rank structure that exists may be significant in examining the role of assertiveness in relation to perceived job stress. In this environment an individual's rank permits his desires to be fulfilled without him having to revert to assertive actions.

Locus of Control

This behavior pattern was significantly related to cortisol level, perceived job stress, cumulative stress and multiplicative stress. The more external locus of control an individual was, the lower the cortisol level. The more

external locus of control the individual was, the higher the levels of perceived job stress, cumulative stress and multiplicative stress. The fact that external locus of control individuals experienced increased job stress is consistent with previous studies (53:116; 2:446; 26:619).

Organizational Climate

This factor was significantly related to cortisol, job stress, cumulative stress and multiplicative stress. As the organizational climate improved, job stress, cumulative stress and multiplicative stress decreased. However, as the organizational climate improved, the levels of cortisol became higher.

Need for Enrichment

This factor was positively related to external stress, cumulative stress and multiplicative stress. This factor was designed to measure an individual's perceived need for enrichment in the job. The fact that it did not relate to job stress but did relate to external stress was surprising. Possibly a need for enrichment within the job is generally more adequately fulfilled than it is outside the job.

Type A/B Behavior

The relationship found between Type A/Type B behavior and stress is consistent with previous studies

(43:15; 17:79; 7:76). The results indicated that Type A individuals had more perceived job stress, external stress, cumulative stress and multiplicative stress. Type B persons showed less job stress, external stress, cumulative stress, and multiplicative stress.

Goal Setting

This factor showed a positive relationship with an individual's stress level. This was contrary to the belief that the more a person is involved in establishing his/her goals, the less stress or anxiety that person would suffer. A possible reason for this positive relationship is that, in many instances an undue amount of emphasis is placed on goal-setting, even to the point of being more harmful than helpful. If a person feels that there is more emphasis placed on setting goals than effectively accomplishing his/her job, then that person may well suffer from an increased stress level.

Available Time for Planning

This factor had an inverse relationship with cumulative stress and multiplicative stress.

Role Conflict

This factor was positively associated with job stress, external stress, cumulative stress and multiplicative stress. The finding that stress increases as role

conflict increases is consistent with previous studies (39:270; 34:347; 10:713).

Intergroup Conflict

Increases in intergroup conflict were associated with increases in job stress, cumulative stress and multiplicative stress. This finding is consistent with Friis (19:594) and Matteson and Ivancevich (34:347) who suggest that intergroup conflict leads to increased stress.

Independent variables listed below that consist of one question are followed by the question number in parenthesis. These questions may be cross-referenced with Appendix A (Stress Assessment Questionnaire) or with Table 1.

Amount of Time Available to Plan for More than Six Months Ahead (Question 30)

Individuals who had time available for long range planning showed increased cortisol levels and decreased cumulative stress and multiplicative stress. Conversely, those who didn't have adequate planning time had the opposite reactions.

Extent That Work Responsibilities Change Over Time (Question 43)

Increased changes in work responsibilities were negatively related to cortisol levels but were positively related to external stress, cumulative stress (job stress +

external stress), and multiplicative stress (job stress * external stress). The fact that frequent changes in work responsibilities led to increased stress is consistent with research conducted by R. Field (14:87).

Having Adequate Tools and Equipment
to Accomplish Job (Question 44)

This independent variable had an inverse relationship to job stress. The lack of adequate tools and equipment increased stress while adequate tools and equipment reduced stress.

Extent that Job Provides Chance to
Know When a Good Job has Been Done
and That the Individual is Respon-
sible for Their Own Work
(Question 52)

This variable showed a positive relationship to increased stress levels. A possible explanation is that the respondent perceived the question to mean that he/she was singularly responsible for a particular job. Having this perception, the individual felt uncomfortable with this burden and it raised their stress level.

Extent That Quantity is More
Important Than Quality
(Question 71)

Those individuals that felt their organizations emphasized quantity more than quality perceived increased job stress, cumulative stress and multiplicative stress.

The emphasis on quantity can be related to high workload levels which have been suggested to cause increased stress levels (11; 19:594; 49:324; 9:211).

Required Tasks to be Performed Are
Like the Kinds of Tasks the Indi-
vidual Prefers (Question 89)

Individuals who perform tasks that they prefer have increased cortisol levels and decreased job stress.

Receiving Assignments Without Ade-
quate Resources and Materials to
Execute It (Question 93)

Those individuals receiving assignments without adequate resources and materials had more job stress, cumulative stress and multiplicative stress.

Satisfaction with Job Security
(Question 101)

Individuals that were satisfied their their job security had less job stress and cumulative stress.

Officer Rank (Question 111)

Officer rank was negatively related to job stress and was positively related to external stress.

Enlisted Rank (Question 112)

Enlisted rank was positively related to external stress.

Wage Grade (Question 114)

Wage grade was negatively related to job stress, cumulative stress and multiplicative stress.

Total Months Experience in Present Job (Question 117)

The more months the individual was in the organization the lower the cortisol level. Previous research suggests that stress does occur when an individual changes jobs (3:665; 14:87).

Body Weight (Question 120)

Body weight was positively related to job stress and negatively related to external stress. An explanation for the above results is not readily apparent. Possibly the apprehension of the Air Force overweight program may explain some of the positive relationship between weight and job stress.

Age (Question 122)

This independent variable was inversely related to cortisol level.

Life Events (Question 126)

Life events that were measured included the death of a spouse, divorce, marital separation, death of a close family member, or serious personal injury. As the number of these events experienced by individuals increased, there

was a corresponding increase in cortisol levels, external stress and multiplicative stress. The fact that these life events are positively related to stress is consistent with the research done by R. Field (14:87).

Educational Level (Question 128)

Educational level was positively related to cortisol. Previous research suggested that the higher one's education, the lower one's stress (54). If chronic stress is related to decreased levels of cortisol (8:181) and chronic stress is present within individuals with lower education levels, then there is a plausible explanation for these results.

Miles Jogged per Week (Question 129)

Increases in the miles jogged per week were associated with decreases in the cortisol level, job stress, external stress, cumulative stress, and multiplicative stress. Although jogging was significantly related to the above dependent variables, exercise in general was not significantly related. This may be explained by the fact that many forms of exercise such as bowling and walking do not require the exertion required to affect one's stress level. Increased exertion may affect the dependent variables of stress through sustained increase in heart rate or through changes in adrenal output.

Extent Job Requires Communication
Between Workers (Question 135)

As the need for communication between workers increased so did the level of job stress. With increased need for communication there exists the possibility that more intergroup conflict will occur which was also positively associated with job stress. Increases in the need for communication was also associated with decreases in external stress.

Extent that Work Group Uses Meeting
to Solve Problems and Establish
Goals and Objectives
(Question 136)

Increases in the meetings to solve problems and establish goals and objectives was negatively related to cortisol levels but was positively related to job stress, cumulative stress and multiplicative stress. At first glance, it would appear that increased meetings to solve problems and establish goals would reduce stress instead of increase stress. However, in many job environments it is possible that these activities have been overemphasized to the point where too many meetings are conducted and as a result they cut into the time required to complete assigned tasks.

Independent Variables as Predictors of Coronary Heart Disease

Organizational Climate

This factor was positively related to HDL cholesterol, negatively related to the total cholesterol/HDL cholesterol ratio and positively related to the product of total cholesterol and cortisol. It was also highly predictive of stress and therefore a possibility exists that stress induced by this variable may be related to coronary heart disease.

Work Information

As the amount of information provided to the individual increased there was a corresponding decrease in the HDL cholesterol level and increases in the cholesterol/HDL cholesterol level. The implication that increased information leads to coronary heart disease is contrary to expectations. This relationship may result out of a situation of information overload.

Intergroup Conflict

This factor was negatively related with total cholesterol and the product of cholesterol and cortisol. Although increases in intergroup conflict resulted in increased job stress, an increase in intergroup conflict appeared to be associated with lower coronary heart disease potential. A possible explanation for this

relationship is that as an individual engages in these conflicts, he/she is venting emotions, reducing stress that would otherwise be internally contained.

Independent variables listed below that consist of one question are followed by the question number in parenthesis. These questions may be cross-referenced with Appendix A (Stress Assessment Questionnaire) or with Table 1.

Amount of Verbal and Written
Communication (Question 98)

As the requirements for verbal and written communication increased there were increases in total cholesterol and in the total cholesterol/HDL cholesterol ratio.

Total Months in the Organization
(Question 116)

As total months in the organization increased there were associated increases in the total cholesterol level and the total cholesterol/HDL cholesterol ratio. There were also increases in the cortisol level.

Body Weight (Question 120)

This independent variable had a negative relationship with HDL cholesterol and a positive relationship with the total cholesterol/HDL cholesterol ratio. The fact that body weight is inversely related to HDL

cholesterol is consistent with findings reported by Kritchevsky, Paoletti and Holmes (30).

Life Events (Question 126)

Increased occurrence of life events such as death of a spouse, divorce, marital separation, death of a close family member or serious personal injury, were positively associated with HDL cholesterol, negatively associated with the total cholesterol/HDL cholesterol ratio and positively associated with the product of total cholesterol and cortisol. These results, which indicate that increased occurrence of stressful life events are associated with decreased coronary heart disease potential, are inconsistent with research conducted by R. Field (14:87).

Miles Jogged per Week
(Question 129)

Increased miles jogged per week resulted in increased HDL cholesterol and decreases in the total cholesterol/HDL cholesterol ratio. Jogging was also associated with decreased job stress, external stress, and cortisol.

CHAPTER VI

SUMMARY AND RECOMMENDATIONS FOR FUTURE RESEARCH

This research has explored how both organizational components and individual components affect stress and coronary heart disease. The results indicate that both the organizational facets and the individual facets taken together play a significant role in explaining the amount of stress and potential for coronary heart disease. Managers who understand these interrelationships and work toward a stress-free environment may find they can reduce absenteeism, improve productivity, reduce turnover rates, improve organizational climate, and increase job satisfaction. The more the individual understands the interrelationships between the job environment and stress as well as the personal attributes that he/she possesses that relate to stress, the more the individual can manage the stressful environment.

This research also suggested that no isolated variable is overwhelming in its ability to predict either stress or coronary heart disease potential. However, when the combinations and interactions of variables are considered, there becomes a strong possibility for predicting stress and coronary heart disease potential.

In the course of conducting the Stress Seminars in conjunction with this research, it became readily apparent that people have a strong need to understand the cause and effects of stress. Continuation of such seminars may prove to be a worthwhile endeavor for individuals and organizations.

Ultimately, a second generation Stress Assessment Package might be developed that will give management the ability to confidently identify potentially stressful situations and to predict coronary heart disease potential. This may move management into a role of preventive medicine where people identified as having stress or coronary heart disease potential could be referred for proper diagnosis.

Recommendations for further research include the following:

1. The increased accuracy of the dependent variables is required. The relationship between chronic stress and acute stress with that of cortisol needs to be examined. In the majority of cases, increased stress resulted in reduced cortisol levels. This is consistent with research conducted by Chaplan, Cobb and French (8:181) who suggest that chronic job stress results in lowered cortisol levels. However, the results may have been affected by the failure to adjust the diurnal pattern of cortisol for wake-up time of the subjects. A method should be created to adjust for the diurnal patterns of cortisol while

considering to what extent the independent variables may affect that pattern. Additionally, further research needs to be conducted to determine the time required for acute stress to progress to chronic stress. The interaction between the dependent variables of cortisol, total cholesterol and HDL cholesterol should also be better defined.

2. A new Stress Assessment Package should be developed by elimination of nonsignificant variables and through refinement of the significant variables. Adding additional personality traits may also be considered.

3. The situational interactions should be explored in greater detail. For example, what is the stress level of a type A person in a job that offers little achievement or requires frequent waiting for parts and materials? Marshall and Cooper (32) suggest that the situational interactions may be of most importance in explaining stress.

4. The seminars conducted in this research may have attracted a sample predisposed toward feelings of stress. In future research the entry into a large organization where a dichotomy of stressed and nonstressed individuals exist may prove to be more beneficial.

APPENDICES

APPENDIX A
STRESS ASSESSMENT PACKAGE

The Stress Assessment Package (SAP) is a tool designed to aid in measuring your personal stress level and determine some of the organizational components that may contribute to stress.

You will find the terms work group, organization, and supervisor used extensively as you complete this questionnaire. The term work group refers to a group of individuals working for the same supervisor, while the term organization refers to the overall organizational unit. For example, if your composition is within a section of a squadron then the squadron is your organization and your section is your work group.

With the exception of the Background Information Section, three types of scales are used in the SAP. Most of the sections will have a seven-point (1-7) scale; with one section having a six-point (1-6) scale. There are, however, four sections that have an eight-point (1-8) scale. In these cases the 8 would be marked if the item is not applicable to you. Mark your answers on the separate answer sheet provided. PLEASE USE A NUMBER 2 PENCIL ONLY. Make heavy black marks that completely fill the appropriate space. For example, using the scale below, if you strongly agree with item statement 1 then you would blacken the 7 space on the answer sheet as shown in the example below.

Scale:

- | | |
|--------------------------------|----------------------|
| 1 = Strongly disagree | 5 = Slightly agree |
| 2 = Moderately disagree | 6 = Moderately agree |
| 3 = Slightly disagree | 7 = Strongly agree |
| 4 = Neither agree nor disagree | 8 = Not applicable |

Item Statement:

1. My supervisor is a good planner.

Answer Response:

	1	2	3	4	5	6	7	8	9	10
1.							■			

It is important that you answer all items honestly. Only in this way can an accurate stress assessment be made.

Your individual responses will be held in the strictest confidence, and will not be provided to any organization or persons. Only those directly involved in this research will have access to your completed SAP.
DO NOT STAPLE OR OTHERWISE DAMAGE THE ANSWER SHEET.

PERSONAL BELIEFS

Instructions

This portion of the questionnaire relates the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives numbered 1 or 2. Using the scale below, indicate which statement most closely follows your own beliefs, and record it on your answer sheet.

- 1 = I strongly agree more with statement 1
- 2 = I moderately agree more with statement 1
- 3 = I slightly agree more with statement 1
- 4 = I slightly agree more with statement 2
- 5 = I moderately agree more with statement 2
- 6 = I strongly agree more with statement 2

1. 1 Children get into trouble because their parents punish them too much.
2 The trouble with most children nowadays is that their parents are too easy with them.
2. 1 In the long run people get the respect they deserve in this world.
2 Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
3. 1 The idea that teachers are unfair to students is nonsense.
2 Most students don't realize the extent to which their grades are influenced by accidental happenings.
4. 1 Becoming a success is a matter of hard work; luck has little or nothing to do with it.
2 Getting a good job depends mainly on being in the right place at the right time.
5. 1 The average citizen can have an influence in government decisions.
2 This world is run by the few people in power, and there is not much the little guy can do about it.
6. 1 In my case, getting what I want has little or nothing to do
2 Many times we might just as well decide what to do by flipping a coin.
7. 1 Getting people to do the right thing depends upon ability; luck has little or nothing to do with it.
2 Who gets to be the boss often depends on who was lucky enough to be in the right place first.

- 1 = I strongly agree more with statement 1
- 2 = I moderately agree more with statement 1
- 3 = I slightly agree more with statement 1
- 4 = I slightly agree more with statement 2
- 5 = I moderately agree more with statement 2
- 6 = I strongly agree more with statement 2

- 8. 1 There is really no such thing as luck.
 2 Most people don't realize the extent to which their lives are controlled by accidental happenings.
- 9. 1 Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.
 2 In the long run the bad things that happen to us are balanced by the good ones.
- 10. 1 It is impossible for me to believe that chance or luck plays an important role in my life.
 2 Many times I feel that I have little influence over the things that happen to me.
- 11. 1 What happens to me is my own doing.
 2 Sometimes I feel that I don't have enough control over the direction my life is taking.

PERSONAL ATTRIBUTES

Instructions

The next set of questions is concerned with your personal attributes. Each item consists of five alternatives. Select the alternative that is the most descriptive of you as an individual. Please record your answer on the answer sheet.

- 12. 1 No other activities give me as much satisfaction as my job.
 2 My primary satisfaction comes from my job but I do enjoy non-work activities.
 3 I get equal satisfaction from my job and non-work activities.
 4 My primary satisfaction comes from non-work activities, although I do enjoy my job.
 5 All of my satisfaction comes from activities outside the work environment.
- 13. 1 Winning is everything; my satisfaction comes from winning.
 2 I like winning any game or event, and am very disappointed when I lose.
 3 I like winning any game or event, and am somewhat disappointed when I lose.
 4 I like winning any game or event, but I equally enjoy the social interaction and participation.
 5 I enjoy the social interaction and participation that comes with a game or event, and losing does not bother me at all.

14. 1 I do my very best when I'm fighting a tight deadline.
2 I seem to do my best work when I have a reasonable deadline to meet.
3 I work equally well whether I have a deadline to meet or not.
4 Although I perform adequately with a deadline to meet, I prefer to not meet a deadline.
5 I do not like deadlines; I do my best work when I'm not hurried in any manner.
15. 1 I am constantly moving some part of my body, such as tapping my foot or drumming my fingers, even when I am sitting down.
2 When I sit down, I usually drum my fingers, play with a pencil, tap my foot, or fidget in other ways.
3 When I sit down, I occasionally drum my fingers, play with a pencil, tap my foot, or fidget in other ways.
4 When I sit down, I seldom drum my fingers, play with a pencil, tap my foot, or fidget in other ways.
5 I totally relax when I sit down. I can sit for extended periods without the slightest movement.
16. 1 I tend to be extremely competitive and hard-driving in everything that I do.
2 I tend to be moderately competitive and hard-driving in everything that I do.
3 I tend to be somewhat competitive and hard-driving in most of my activities.
4 I tend to be relaxed and noncompetitive in the majority of my activities.
5 The more relaxed and noncompetitive I can be, the more I can enjoy whatever it is I do.
17. 1 I hate to wait on anything or anybody.
2 I do not enjoy waiting but I will if I absolutely have to.
3 Although I don't really enjoy waiting, I don't mind it if I don't have to wait too long.
4 I don't mind waiting; there are many situations where one must wait.
5 Waiting on something or someone is a pleasant opportunity to relax.
18. 1 I very frequently get very upset and angry with people, but I don't show it.
2 I frequently get upset and angry with people, but I may not show it.
3 I sometimes get upset or angry with people, and most of the time I will express my anger to them.
4 I rarely get upset or angry with people, but when I do, I always express my feelings freely.
5 I very rarely get upset with anyone; most incidents aren't worth getting angry over.

19. 1 I am always in a rush, even when I don't have to be.
2 Most of the time I'm in a hurry, even when I don't have to be.
3 I occasionally find myself in a hurry, even though most of the time I don't have to.
4 I seldom hurry myself; only when I have to.
5 I will not hurry myself, even when I know I'm late.
20. 1 I would like for people to respect me primarily because of the things I accomplish.
2 I would like for people to respect me for who I am, but more importantly, for what I accomplish.
3 I want to be respected for who I am and what I accomplish.
4 I would like for people to respect me for what I accomplish, but more importantly, for who I am.
5 I would rather be respected for who I am, not what I accomplish.
21. 1 I set very high work standards for myself, and get very upset when I don't meet them.
2 I set high work standards for myself, and get upset when I don't meet them.
3 I set my own work standards, and it bothers me somewhat if I don't meet them.
4 I set work standards for myself, and it bothers me to a little extent if I don't meet them.
5 I maintain work standards that I can make without overextending myself, and I do not get upset if I occasionally fail.
22. 1 I always try to do too much, as a result I always feel tired.
2 I frequently try to do too much, and as a result I feel tired most of the time.
3 On rare occasions I find myself trying to do too much; when these occasions arise, I slow down.
4 I pace myself in accomplishing tasks so that they are all accomplished with the minimum amount of fatigue.
5 I will not overextend myself, even if it means not getting something done.
23. 1 I eat very fast, because I feel that meals waste too much of my time.
2 I eat fast, because sometimes I feel that I could put the time I spend eating to better use.
3 I eat at a moderate pace.
4 I eat slowly, because I can enjoy the meal more that way.
5 I eat very slowly; the more slowly and relaxed I eat, the better I enjoy my meals.

PERCEIVED PRODUCTIVITY

Instructions

The statements below deal with the output of your group. For some jobs certain statements may not be applicable. Should this be the case for your work group, then you should select the not applicable statement coded "8" below. Indicate your agreement with the statement by selecting the answer which best represents your attitude concerning your work group.

- | | |
|--------------------------------|----------------------|
| 1 = Strongly disagree | 5 = Slightly agree |
| 2 = Moderately disagree | 6 = Moderately agree |
| 3 = Slightly disagree | 7 = Strongly agree |
| 4 = Neither agree nor disagree | 8 = Not applicable |

24. The quality of output of your work group is very high.
25. When high priority work arises, such as short suspenses, crash programs, and schedule changes, the people in my work group do an outstanding job in handling these situations.
26. Your work group's performance in comparison to similar work groups is very high.
27. The quantity of output of your work group is very high.

JOB INVENTORY

Instructions

Below are items which relate to your job. Read each statement carefully and then decide to what extent the statement is true of your job. Indicate the extent that the statement is true for your job by choosing the statement below which best represents your job.

- | | |
|-----------------------------|------------------------------|
| 1 = Not at all | 5 = To a fairly large extent |
| 2 = To a very little extent | 6 = To a great extent |
| 3 = To a little extent | 7 = To a very great extent |
| 4 = To a moderate extent | |

Select the corresponding number for each question and enter it on the separate answer sheet.

28. To what extent does your job provide a great deal of freedom and independence in scheduling your work and selecting your own procedures to accomplish it?
29. To what extent does your job give you freedom to do your work as you see fit?
30. To what extent do you use your time to plan for more than 6 months ahead?

- | | |
|-----------------------------|------------------------------|
| 1 = Not at all | 5 = To a fairly large extent |
| 2 = To a very little extent | 6 = To a great extent |
| 3 = To a little extent | 7 = To a very great extent |
| 4 = To a moderate extent | |

31. To what extent do you use your time for weekly or monthly planning?
32. To what extent do you use your time for daily planning?
33. To what extent are you aware of promotion/advancement opportunities that affect you?
34. To what extent is your work group involved in establishing goals?
35. To what extent do you have the opportunity to progress up your career ladder?
36. To what extent are you being prepared to accept increased responsibility?
37. To what extent do people who perform well receive recognition?
38. To what extent is there conflict between your work group and another work group in your organization?
39. To what extent is there conflict between your organization and another organization with which you have some work-related dealings?
40. To what extent are your job performance goals realistic?
41. To what extent does your job provide you with the chance to finish completely the piece of work you have begun?
42. To what extent do you feel as though too many people depend upon you too much of the time?
43. To what extent do your work responsibilities change over time?
44. To what extent do you have adequate tools and equipment to accomplish your job?
45. To what extent are you proud of your job?
46. To what extent does your job give you a feeling of pride and self-worth?
47. To what extent does doing your job well affect a lot of people?

48. To what extent is your job significant, in that it affects others in some important way?
49. To what extent does your job require you to do many different things, using a variety of your talents and skills?
50. To what extent is your work group involved in establishing goals?
51. To what extent are your job performance goals clear and specific?
52. To what extent does your job provide the chance to know for yourself when you do a good job, and to be responsible for your own work?
53. To what extent do you know exactly what is expected of you in performing your job?
54. To what extent would you like to have the opportunity for personal growth in your job?
55. To what extent would you like to have the opportunity to use your skills in your job?
56. To what extent would you like to have the opportunity to perform a variety of tasks in your job?
57. To what extent are the requirements placed on you in your job in line with your interests and values?
58. To what extent does your present job fulfill your expectations of what a good job involves?

SUPERVISOR INVENTORY
Instructions

The statements below describe characteristics of managers or supervisors. Indicate your agreement by choosing the statement below which best represents your attitude concerning your supervisor.

- | | |
|--------------------------------|----------------------|
| 1 = Strongly disagree | 5 = Slightly agree |
| 2 = Moderately disagree | 6 = Moderately agree |
| 3 = Slightly disagree | 7 = Strongly agree |
| 4 = Neither agree nor disagree | 8 = Not applicable |

Select the corresponding number and mark your answer on the separate answer sheet.

59. My supervisor is a good planner.
60. My supervisor represents the group at all times.

61. My supervisor establishes good work procedures.
62. My supervisor has made his responsibilities clear to the group.
63. My supervisor performs well under pressure.
64. My supervisor always helps me improve my performance.
65. My job performance has improved due to feedback received from my supervisor.
66. My supervisor frequently gives me feedback on how well I am doing my job.
67. My relationship with my supervisor is a good one.

ORGANIZATION CLIMATE INVENTORY
Instructions

Below are items which describe characteristics of your organization. Indicate your agreement by choosing the statement below which best represents your opinion concerning your organization.

- | | |
|--------------------------------|----------------------|
| 1 = Strongly disagree | 5 = Slightly agree |
| 2 = Moderately disagree | 6 = Moderately agree |
| 3 = Slightly disagree | 7 = Strongly agree |
| 4 = Neither agree nor disagree | 8 = Not applicable |

68. Your organization provides all the necessary information for you to do your job effectively.
69. Your organization provides adequate and accurate information to your work group.
70. I could produce a higher quality product, if I only had more time.
71. Quantity seems to be more important to this organization than quality.
72. I never have enough time to adequately complete my assigned tasks.
73. Your organization is very interested in the attitudes of the group members toward their jobs.
74. Your organization has a very strong interest in the welfare of its people.
75. I am very proud to work for this organization.
76. I feel motivated to contribute my best efforts to the mission of this organization.

- | | |
|--------------------------------|----------------------|
| 1 = Strongly disagree | 5 = Slightly agree |
| 2 = Moderately disagree | 6 = Moderately agree |
| 3 = Slightly disagree | 7 = Strongly agree |
| 4 = Neither agree nor disagree | 8 = Not applicable |

77. This organization rewards individuals based on performance.
78. I know precisely my role as an employee in this organization.
79. I feel that my peers do not understand what is involved in my job.
80. I view my function within the organization in exactly the same way my peers, subordinates, and superiors view it.
81. I am constantly being instructed to do my job in different ways by different people.
82. I cannot please one superior without displeasing another.
83. My needs are in conflict with those of the organization.
84. There are far too many policies and regulations constricting my effective job performance.
85. I could do my job better if the organization had fewer rules.
86. My relationship with my peers is a good one.
87. There are very few disagreements or conflicts between myself and my co-workers.
88. My job causes me a great deal of stress and anxiety.
89. I work on a job where the required tasks to be performed are like the kinds of tasks I prefer in a job.
90. I have to do things that should be done differently.
91. I receive an assignment without the manpower to complete it.
92. I work on unnecessary things.
93. I receive an assignment without adequate resources and materials to execute it.

JOB SATISFACTION QUESTIONNAIRE

Instructions

The items below relate to your job or the Air Force as a profession. Indicate how satisfied or dissatisfied you are with each item. Choose the statement below which best describes your degree of satisfaction or dissatisfaction.

- | | |
|--|--------------------------|
| 1 = Extremely dissatisfied | 5 = Slightly satisfied |
| 2 = Moderately dissatisfied | 6 = Moderately satisfied |
| 3 = Slightly dissatisfied | 7 = Extremely satisfied |
| 4 = Neither satisfied nor dissatisfied | 8 = Not applicable |

94. Feeling of Helpfulness:

The chance to help people and improve their welfare through the performance of your job.

95. Family Attitude Toward Job:

The recognition and the pride your family has in the work you do.

96. Moral Acceptability of Job:

The chance to do things not violating your sense of "right and wrong."

97. Self-improvement Opportunities:

The educational and recreational opportunities provided by the Air Force for self-improvement.

98. Verbal and Written Communication:

The amount of required telephone communication and required paperwork in your job.

99. Work Itself:

The challenge, interest, importance, variety, and feelings of accomplishment you receive from your work.

100. Work Schedule:

Your work schedule; flexibility and regularity of your work schedule; the number of hours you work per week.

101. Job Security

102. Acquired Valuable Skills:

The chance to acquire valuable skills in your job which prepare you for future opportunities.

103. Your Job as a Whole

ASSERTIVENESS INVENTORY

Instructions

The following questions will attempt to measure your level of assertiveness. Indicate your agreement with the statement by selecting the answer which best represents your opinion.

- | | |
|-----------------------------|------------------------------|
| 1 = Not at all | 5 = To a fairly large extent |
| 2 = To a very little extent | 6 = To a great extent |
| 3 = To a little extent | 7 = To a very great extent |
| 4 = To a moderate extent | |

104. To what extent do you call it to his/her attention when a person is highly unfair?
105. To what extent do you speak out or protest when someone takes your place in line?
106. To what extent do you call attention to the situation in which a latecomer is waited on before you?
107. To what extent do you protest a person kicking or bumping your chair in a movie or lecture?
108. To what extent do you insist that your landlord (mechanic, repairman, etc) make repairs that are his responsibility to make?
109. To what extent are you able to speak up for your viewpoint when you differ with a person you respect?
110. To what extent are you able to refuse unreasonable requests made by friends?

BACKGROUND INFORMATION

Instructions

The last section of this survey concerns your background. Please use the separate answer sheet and darken the space which corresponds with your response to each question.

111. If you are an officer, your grade level is:

- | | |
|-----------------------|-----------------|
| 1 I am not an officer | 6 0-5 |
| 2 0-1 | 7 0-6 |
| 3 0-2 | 8 0-7 |
| 4 0-3 | 9 0-8 |
| 5 0-4 | 10 0-9 or above |

112. If you are an enlisted person, your grade level is:

- | | | | |
|---|-------------------|----|-----|
| 1 | I am not enlisted | 6 | E-5 |
| 2 | E-1 | 7 | E-6 |
| 3 | E-2 | 8 | E-7 |
| 4 | E-3 | 9 | E-8 |
| 5 | E-4 | 10 | E-9 |

113. If you are a General Schedule (GS) employee, your grade level is:

- | | | | |
|---|------------------------|----|-------------|
| 1 | I am not a GS employee | 6 | 09 to 10 |
| 2 | 01 to 02 | 7 | 11 to 12 |
| 3 | 03 to 04 | 8 | 13 to 14 |
| 4 | 05 to 06 | 9 | 15 to 16 |
| 5 | 07 to 08 | 10 | 17 or above |

114. If you are a Wage Grade (WS or WG) employee, your grade level is:

- | | | | |
|---|------------------------------|----|-------------|
| 1 | I am not a WS or WG employee | 6 | 09-10 |
| 2 | 01-02 | 7 | 11-12 |
| 3 | 03-04 | 8 | 13-14 |
| 4 | 05-06 | 9 | 15-16 |
| 5 | 07-08 | 10 | 16 or above |

115. If you are a civilian employee (not employed by the federal government), or Air Force Reservist, which of the following best describes your occupation?

- 1 Secretary
- 2 First line supervisor
- 3 Mid-level manager
- 4 Upper-level manager (executive)
- 5 Other

116. Total months in this organization is:

- 1 Less than 1 month.
- 2 More than 1 month, less than 6 months.
- 3 More than 6 months, less than 12 months.
- 4 More than 12 months, less than 18 months.
- 5 More than 18 months, less than 24 months.
- 6 More than 24 months, less than 36 months.
- 7 More than 36 months.

117. Total months experience in present job is:

- 1 Less than 1 month.
- 2 More than 1 month, less than 6 months.
- 3 More than 6 months, less than 12 months.
- 4 More than 12 months, less than 18 months.
- 5 More than 18 months, less than 24 months.
- 6 More than 24 months, less than 36 months.
- 7 More than 36 months.

118. Your race is:

- 1 American Indian or Alaskan Native
- 2 Asian or Pacific Islander
- 3 Black, not of Hispanic Origin
- 4 Hispanic
- 5 White, not of Hispanic Origin
- 6 Other

119. Your sex is:

- 1 Male
- 2 Female

120. Your weight is:

- 1 Less than or equal to 100 pounds.
- 2 More than 100, less than or equal to 125.
- 3 More than 125, less than or equal to 150.
- 4 More than 150, less than or equal to 175.
- 5 More than 175, less than or equal to 200.
- 6 More than 200, less than or equal to 225.
- 7 More than 225.

121. Your height is:

- 1 Less than or equal to 5 feet.
- 2 More than 5 feet, less than or equal to 5 feet 3 inches.
- 3 More than 5 feet 3 inches, less than or equal to 5 feet 6 inches.
- 4 More than 5 feet 6 inches, less than or equal to 5 feet 9 inches.
- 5 More than 5 feet 9 inches, less than or equal to 6 feet.
- 6 More than 6 feet, less than or equal to 6 feet 3 inches.
- 7 More than 6 feet 3 inches.

122. Your age is:

- 1 Less than 20.
- 2 20 to 25.
- 3 26 to 30.
- 4 31 to 40.
- 5 41 to 50.
- 6 More than 50.

123. If you smoke cigarettes, you smoke the following number of cigarettes:

- 1 I do not smoke cigarettes.
- 2 Less than 5 per day.
- 3 6-10 per day.
- 4 11-20 per day.
- 5 21-30 per day.
- 6 31-40 per day.
- 7 More than 40 per day.

124. If you smoke a pipe or cigars, you smoke the following number of pipe bowls or cigars:

- 1 I do not smoke a pipe or cigars.
- 2 Less than 2 bowls or cigars per day.
- 3 2-4 bowls or cigars per day.
- 4 5-6 bowls or cigars per day.
- 5 7-8 bowls or cigars per day.
- 6 9-10 bowls or cigars per day.
- 7 More than 10 bowls or cigars per day.

125. You engage in physical exercise:

- 1 Less than 1 hour per week.
- 2 More than 1 hour, less than or equal to 2 hours per week.
- 3 More than 2 hours, less than or equal to 3 hours per week.
- 4 More than 3 hours, less than or equal to 4 hours per week.
- 5 More than 4 hours, less than or equal to 5 hours per week.
- 6 More than 5 hours, less than or equal to 6 hours per week.
- 7 More than 6 hours per week.

126. Have you recently, within the last year, experienced any of the following: death of your spouse, divorce, marital separation, death of a close family member, or serious personal injury?

- 1 No.
- 2 Yes, one of the above.
- 3 Yes, two of the above.
- 4 Yes, three of the above.
- 5 Yes, four of the above.
- 6 Yes, all of the above.

127. Your lifestyle away from your job is extremely tense and stressful.

- 1 Not at all.
- 2 To a very little extent.
- 3 To a little extent.
- 4 To a moderate extent.
- 5 To a fairly large extent.
- 6 To a great extent.
- 7 To a very great extent.

128. Your highest educational level obtained was:

- 1 Non high school graduate
- 2 High school graduate or GED
- 3 Some college work
- 4 Bachelor's degree
- 5 Some graduate work
- 6 Master's degree
- 7 Doctoral degree

129. If you are a jogger, the average number of miles you jog per week is:

- 1 I do not jog.
- 2 1-2 miles.
- 3 3-4 miles.
- 4 5-6 miles.
- 5 7-8 miles.
- 6 9-10 miles.
- 7 More than 10 miles.

130. Highest level of professional military education (residence or correspondence):

- 1 None or not applicable.
- 2 NCO Orientation Course or USAF Supervisor Course (NCO Phase 1 or 2).
- 3 NCO Leadership School (NCO Phase 3).
- 4 NCO Academy (Phase 4).
- 5 Senior NCO Academy (Phase 5).
- 6 Squadron Officer School.
- 7 Intermediate Service School (Officer)
- 8 Senior Service School (Officer) (e.g., Air War College).

131. How many people do you directly supervise (i.e., those for which you write performance reports)?

- | | |
|----------|--------------|
| 1 None | 5 9 to 12 |
| 2 1 to 2 | 6 13 to 20 |
| 3 3 to 5 | 7 21 or more |
| 4 6 to 8 | |

132. Does your supervisor actually write your performance report?

- 1 Yes
- 2 No

133. Your work requires you to work primarily:

- 1 Alone.
- 2 With one or two people.
- 3 As a small group team member (3 to 5 people).
- 4 As a large group team member (6 or more people).
- 5 Other.

134. How stable are your work hours?

- 1 Highly Stable--Routine 8 hours a day.
- 2 Very Stable--Nearly routine 8 hour day.
- 3 Moderately Stable--Shift work which periodically changes.
- 4 Slightly Unstable--Irregular working hours.
- 5 Highly Unstable--Frequent TDYs, frequently on call.

135. Your job requires how much communication between workers?

- 1 Very little
- 2 Little
- 3 Moderate
- 4 Very Frequent
- 5 Almost continuous

136. To what extent in your work group are group meetings used to solve problems and establish goals and objectives?

- 1 None
- 2 Occasionally
- 3 About half the time
- 4 Almost totally

137. Your work schedule is basically:

- 1 Shift work, usually days.
- 2 Shift work, usually swing shift.
- 3 Shift work, usually nights.
- 4 Shift work, usually days and nights.
- 5 Daily work only.
- 6 Crew schedule.
- 7 Other.

138. Which of the following best describes your career or employment intentions?

- 1 Planning to retire in the next 12 months.
- 2 Will continue in/with the Air Force as a career.
- 3 Will most likely continue in/with the Air Force as a career.
- 4 May continue in/with the Air Force.
- 5 Will most likely not make the Air Force a career.
- 6 Will separate/terminate from the Air Force as soon as possible.

139. Are you currently (within the last week) taking any prescribed or non-prescribed medication?

1. No.
2. Yes. If yes, then turn to the next page and fill in your identification number (the one on the lower right corner of your optical scan form) and complete the page.

PLACE I.D. NUMBER HERE

--	--	--	--

1. Medication Name:

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

2. Use (if known):

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

3. Dosage (if known):

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

SUMMARY OF QUESTIONS

A - JOB ENVIRONMENT FACETS

General Organization Climate

73
74
75
76
77

Job Enhancement

45
46
47
48
49

Role Ambiguity

78
79
80

Autonomy

28
29

Role Conflict

81
82
83
38
39

Planning and Time Management

30
31
32

Policies and Regulations

84
85

Goals

34
40
41
50
51
52
53

Organizational Communications Climate

68
69

Advancement/Recognition

33
35
36
37

Productivity

24
25
26
27

Meaningful/Responsible Work

54
55
56

Job Related Satisfaction

94
95
96
97
98
99
100
101
102
103

Management/Supervision

59
60
61
62
63
67

Supervisor Asst/Feedback

64
65
66

Work Load/Time Pressure

70
71
72

Responsibility for People

42

Co-Worker Relations

86
87

Change in Work Responsibilities

43

Equipment Limitations

44

Assertiveness

104
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109
110

Person/Role Congruence

57
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92
93

Does Supervisor Write Performance Report?

132

Number of People Worked With

133

Regularity of Work Hours

134

Communication Between Co-Workers

135

Goal Participation

136

Work Schedule

137

Career Employment Intentions

138

How Many People Supervised

131

Job Tenure

116
117

B - PERSONAL FACETS

Locus of Control

1
2
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4
5
6
7
8
9
10
11

Life Events

126

Exercise

125
129

Medication Usage

139

Smoking Habits

123
124

Type A/Type B

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14
15
16
17
18
19
20
21
22
23

Transgenerated Variables

Job Motivation Index

Question 49 + Question 41 + Question 48

3

* Question 50 * Question 29

Need for Enrichment Index

Question 56 + Question 55 + Question 54

3

Demographics

Rank	111-115
Race	118
Sex	119
Weight/Height	120-121
Age	122
Education	128
Military Education	130

C - PERCEIVED STRESS

External (non-job) Stress

127

Job Stress

88

APPENDIX B
SUMMARY OF REGRESSION EQUATIONS

In this summary table, it was necessary to use shorthand notation in order to simplify the equations. Three alpha characters (V, X, Y) will be used. Following each letter, a subscript will appear. In the case of the selected independent variables (those not contributing to a factor score), the letter V will be followed by a number corresponding to the question number of that item in the Stress Assessment Package. The remainder of the alpha designators are summarized below.

Factor Scores

X ₁ = Job Satisfaction	X ₁₀ = Rules and Regulations
X ₂ = Supervision	X ₁₁ = Goal Clarity
X ₃ = Assertiveness	X ₁₂ = Job Autonomy
X ₄ = Productivity	X ₁₃ = Job Importance
X ₅ = Locus of Control	X ₁₄ = Goal Setting
X ₆ = Organizational Climate	X ₁₅ = Availability of Time to Plan
X ₇ = Need for Enrichment	X ₁₆ = Role Conflict
X ₈ = Type A/B Behavior	X ₁₇ = Work Information
X ₉ = Time Adequacy	X ₁₈ = Intergroup Conflict

Dependent Variables

Y ₁ = Cortisol Level
Y ₂ = Perceived Job Stress
Y ₃ = Perceived External Stress (non-job)
Y ₄ = Cumulative Stress [Job Stress (+) External Stress]
Y ₅ = Multiplicative Stress [Job Stress (*) External Stress]
Y ₆ = Total Cholesterol Level

Y_7 = HDL Cholesterol Level

Y_8 = Ratio of Total Cholesterol to HDL Cholesterol

Y_9 = Total Cholesterol (*) Cortisol

Dependent Variable--Cortisol

$$Y_1 = 12.143 + 0.839X_{14} + 0.635X_6 - 0.708X_5$$

$$Y_1 = 7.542 + 2.511V_{126} + 0.891V_{30} + 0.522V_{89} + 0.504V_{117} \\ - 1.109V_{122} + 0.691V_{128} - 1.196V_{136} + 0.744V_{131} \\ - 0.699V_{43} - 0.358V_{129}$$

Dependent Variable--V88 (Perceived Job Stress)

$$Y_2 = 4.094 - 0.454X_8 + 0.308X_{18} + 0.379X_5 + 0.295X_{16} \\ - 0.289X_1 + 0.281X_{14} - 0.251X_6$$

$$Y_2 = 2.249 + 0.346V_{93} - 0.461V_{114} - 0.186V_{129} - 0.293V_{101} \\ + 0.159V_{71} + 0.252V_{136} + 0.316V_{52} - 0.141V_{111} \\ + 0.225V_{120} - 0.134V_{99} - 0.165V_{44} + 0.234V_{135} \\ + 0.115V_{115}$$

Dependent Variable--V127 (Perceived External
(non-job) Stress)

$$Y_3 = 2.729 - 0.457X_8 + 0.213X_7 - 0.246X_{11} - 0.219X_3 \\ + 0.183X_{16} - 0.136X_4 - 0.138X_1$$

$$Y_3 = 1.552 + 0.482V_{126} + 0.207V_{88} - 0.309V_{135} + 0.138V_{112} \\ + 0.167V_{41} + 0.114V_{111} - 0.140V_{120} - 0.067V_{129} \\ + 0.134V_{43}$$

Dependent Variable--Cumulative Stress
[Job Stress (+) External Stress]

$$Y_4 = 13.036 - 0.999X_8 + 0.470X_5 + 0.475X_{16} + 0.430X_{18} \\
- 0.305X_1 - 0.362X_6 + 1.382X_7 + 0.320X_{14} \\
- 0.220X_{15} - 0.353X_2 + 0.281X_{13} - 1.028X_9$$

$$Y_4 = 1.749 + 0.372V_{93} - 0.272V_{129} + 0.781V_{126} + 0.256V_{71} \\
+ 0.434V_{52} - 0.288V_{101} - 0.358V_{114} + 0.241V_{115} \\
+ 0.383V_{43} + 0.276V_{138} - 0.195V_{36} + 0.436V_{136} \\
- 0.240V_{30}$$

Dependent Variable--Multiplicative Stress
[Job Stress (*) External Stress]

$$Y_5 = 11.981 - 2.823X_8 - 1.473X_1 + 1.740X_7 + 1.406X_{18} \\
+ 1.873X_{16} + 1.343X_5 + 1.251X_{14} - 1.178X_{15} \\
- 1.107X_{11} - 0.898X_3 - 0.859X_6 - 0.792X_2$$

$$Y_5 = -1.595 + 0.890V_{93} - 0.961V_{129} - 0.966V_{76} + 1.032V_{115} \\
- 1.463V_{114} + 1.306V_{43} + 0.793V_{71} + 1.978V_{126} \\
+ 0.907V_{52} + 1.520V_{136} - 0.792V_{30}$$

Dependent Variable--Total Cholesterol

$$Y_6 = 208.3 - 6.988X_{18}$$

$$Y_6 = 144.363 + 7.641V_{122} + 4.022V_{35} - 7.471V_{136} + 3.346V_{98} \\
+ 2.792V_{116}$$

Dependent Variable--HDL Cholesterol Level

$$Y_7 = 49.242 + 1.696X_6 - 1.886X_{17}$$

$$Y_7 = 54.350 - 3.713V_{120} + 0.715V_{129} - 1.394V_{111} - 0.872V_{117} \\ + 3.668V_{126} + 0.879V_{76} + 0.755V_{33} - 0.896V_{112} \\ + 1.020V_{51}$$

Dependent Variable--Ratio of Total Cholesterol
to HDL Cholesterol

$$Y_8 = 4.439 + 0.169X_1 + 0.205X_{17} + 0.169X_{10} - 0.138X_6$$

$$Y_8 = 2.709 + 0.475V_{120} + 0.169V_{116} - 0.373V_{126} - 0.084V_{129} \\ + 0.152V_{111} - 0.231V_{118} - 0.110V_{97} + 0.078V_{98} \\ - 0.166V_{37} + 0.123V_{43} + 0.087V_{112} + 0.113V_{101} \\ - 0.119V_{40} + 0.078V_{78}$$

Dependent Variable--Total Cholesterol
(*) Cortisol

$$Y_9 = 2578.519 + 229.558X_{14} - 172.506X_{18} + 163.552X_{13} \\ + 145.148X_6$$

$$Y_9 = 146.293 + 497.689V_{126} + 139.610V_{89} + 183.436V_{30} \\ + 94.503V_{117} - 309.108V_{136} + 126.584V_{115} \\ + 116.780V_{131}$$

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