

UNIVERSITY OF MANITOBA

CONTROLLABILITY, TYPE A BEHAVIOUR

AND CORONARY PRONENESS

by

ATHOLL T. MALCOLM

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A thesis submitted to the Faculty of Graduate Studies of  
the University of Manitoba in partial fulfillment of the requirements  
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To my wife, Lynn, who offers constant  
support and encouragement in all areas of  
my life, with sincere love and gratitude.

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ABSTRACT

## CONTROLLABILITY, TYPE A BEHAVIOUR AND CORONARY PRONENESS

Psychophysiological research has identified a behavioural syndrome which is associated with coronary heart disease. This syndrome, labelled the Type A Behaviour Pattern (TABP), typified by an extreme sense of time urgency, excessive competitiveness and aggression, and an intense drive to succeed, is reported to identify individuals according to their likelihood of developing coronary heart disease (CHD), with Type A individuals being twice as likely to develop pathology in comparison to Type B individuals. Nevertheless the majority of Type As do not develop CHD. The effect of stress relative to the elicitation of the TABP suggests, however, that personality and environmental factors combine to yield the individual's perceived degree of control over any specific threat. This study hypothesized that individual differences based, in part, on self perception of control interact with the TABP to create coronary-proneness. Therefore the inter-relationship between controllability, the TABP, traditional risk factors and CHD was examined.

Subjects, staff officers of the Canadian Armed Forces (Air Command), completed a battery of tests which measured Job Involvement, Locus of Control, Job Satisfaction, Mastery (the preference for challenging tasks), Work Attitude, Competitiveness, Field Dependence/Independence, Social Support and satisfaction with that support, and Type A behaviour using the Jenkins Activity for Health Survey (JAS).

In addition, risk of developing CHD was estimated using the Coronary Risk Handbook and medical records. All data except risk of CHD and Type A scores were factor analyzed and controllability emerged as a prime dimension. A highly significant canonical correlation was obtained between factor scores on the ten retained factors and the Type A and coronary risk scores. Further examination of the data indicated that extreme Type As who were physiologically at risk of developing CHD could be identified on the basis of scores on the controllability factor. These results suggest that measurement of the individual's perceived (self-attributed) need to control may more accurately identify those at risk of CHD than self report measures of the TABP.

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## CONTROLLABILITY, TYPE A BEHAVIOUR AND CORONARY PRONENESS

The 20th century has been remarkable in that it has witnessed a dramatic increase in coronary heart disease (CHD), (Rosenman & Chesney, 1980), with the victims frequently being young and belonging to Western industrialized societies (Michaels, 1966; White, 1974). In the United States, the disease affects more than 700,000 persons each year. It can be forecast, for example, that one out of 10 males will develop CHD in his middle years and that in 50% of cases, the first symptom will be a heart attack. Also, in 50% of the cases, CHD will result in death. The cost is immense. With reference to the United States Air Force alone, DeHart (1980) indicates that 500-800 personnel are affected each year at an estimated cost of about \$50 million in non-effectiveness, personnel replacements, medical care, disability and death benefits. Given that military personnel have compulsory medical examinations and are required to maintain particular levels of physical fitness, it is likely that this figure would be higher in civilian society.

In its early stage, CHD refers to lesions of the coronary arteries, a condition known as arteriosclerosis, which results in the initiation of a self-healing process. Newly formed cells create a plaque to cover the lesions, and a thickening of the inner wall of the artery occurs. These cells, consisting of lipids, form the fatty streaks which become atheromatous and are "considered the basis of

coronary artery disease" (Glass, 1977, p. 3). Such a state may develop into one of two forms of CHD: angina pectoris, in which blood flow in the heart muscle is restricted, or acute myocardial infarction, in which the plaque decays and ruptures due to a growth rate exceeding the available nutrition from the blood supply (Glass, 1977).

Biomedical research and practice are reported to have made "impressive gains" during the last 30 years (Cooper, Detre, Weiss, Bristow, Carleton, Dustan, Eliot, Feinleib, Jesse, Klokhe, Schwartz, Shields & Stallones, 1980). Between 1920 and 1967, the death rate in the United States due to CHD exceeded the death rate for all non-cardiovascular diseases combined. Since that time, the situation has reversed and in 1976 there were approximately 150 fewer deaths per 100,000 population due to CHD than other diseases (National Center for Health Statistics, 1976). Cooper et al. attributed this decline to improved coronary care units, increased emergency medical services, improved in-hospital regimens and advances in pharmacology. Also, contributing to this trend is the huge public and health professional education campaign. These authors concluded that "The magnitude of the problem, however, demands our most comprehensive efforts, particularly in matters of lifestyle, which relate to many of the known and suspected risk factors for coronary heart disease" (p. 1199).

Dawber & Kannel (1961) suggested that the risk of CHD may be associated with certain specific factors such as: (1) aging; (2) sex (male); (3) elevated serum cholesterol; (4) elevated serum

lipoproteins; (5) hypertension; (6) dietary intake of animal fats and cholesterol; (7) heavy cigarette smoking; (8) diabetes mellitus; (9) genetic factors; (10) specific diseases such as hypothyroidism; (11) obesity; (12) physical inactivity; and (13) electro-cardiographic evidence of left ventricular hypertrophy. Nevertheless, skepticism remains concerning the capability of predicting CHD from these factors. Jenkins (1971) maintained that even the best combination of them failed to identify most cases of CHD, and Rosenman and Chesney (1980) argued that although "major culpability has been assigned to a number of factors ... their linkage to CHD still remains imprecise" (p. 1). Nevertheless, attempts have been made to predict the probability of occurrence of new cases of CHD. Probability tables based on certain risk factors (sex, age, cigarette smoking, blood pressure, serum cholesterol, glucose tolerance and left ventricular hypertrophy) were derived from an epidemiological study of the United States Public Health Service which made use of the longitudinal results of the Framingham Heart Study (Haynes, Levine, Scotch, Feinleib & Kannel, 1978). The tables comprise the "Coronary Risk Handbook" and are reported to be valid for American Caucasian populations.

Recognizing the need for increased power in the prediction of CHD, Friedman & Rosenman (1959) pioneered research focussing on the impact of behavioural and environmental factors upon the cardiovascular system, and Friedman (1969) contributed the following well known definition of what he labelled as Type A behaviour:



A characteristic action-emotion complex which is exhibited by those individuals who are engaged in a relatively chronic struggle to obtain an unlimited number of poorly defined things from their environment in the shortest period of time and, if necessary, against the opposing efforts of other things or persons in this same environment (p. 84).

Behaviours which are more or less opposite from those defined were labelled as Type B. More recently many authors (e.g. Caffrey, 1979; Sparacino, 1979) described the A/B dichotomy as a behavioural syndrome rather than some personality dimension. Included in this syndrome according to Jenkins (1975) are extremes of competitiveness, striving for achievement, aggressiveness, haste, impatience, restlessness, feelings of being constantly under pressure, and the deep commitment to vocation or profession.

Rosenman & Chesney (1980) summarized research from the Stanford Research Institute by describing the Type A Behaviour Pattern (TABP), as an "overt behavioral syndrome or style of living. It is thus neither a personality trait nor a standard reaction to challenge but is rather the reaction of a characterologically pre-disposed person to a situation which is perceived as a threat or challenge" (p. 5).

Since the initial proposals of Friedman & Rosenman, research, described below, has analysed and refined the TABP with the purpose of

increasing its strength of predicting those who will develop CHD. As will be argued, however, predictability remains low. In order to examine why this is so, various means of measuring the degree of Type A behaviour will be examined and compared. Further, various independent factors of the TABP will be identified. One additional factor, labelled "controllability", will be examined which to date has only peripherally been linked to the TABP (see Matthews, 1982 for a comprehensive review) although it has been related to certain physiological correlates of CHD. The goal of this research, then, will be to identify a sub-group of Type A individuals who perceive their environment as exerting control over them, rather than vice versa.

Studies will be described which have identified executives of middle management status as being coronary prone, and the hypotheses of this study will be related to such a population - commissioned officers of Captain to Colonel rank of the Canadian Forces' Air Command.

#### TYPE A BEHAVIOUR AND CORONARY PRONENESS

##### Review

As previously stated, Rosenman's goal was to permit the prediction of those individuals who would suffer from CHD prior to its onset and, if possible, prevent the disease. As a result, the terms "TABP" and "coronary prone behaviour (CPB)" are frequently used interchangeably; indeed, Matthews & Saal (1978) use the term "The Type A coronary-prone behaviour pattern" (p. 631). Examples from the literature which have led

to this tendency, will be reviewed and some objections to the global assumption that is implied will follow.

Data related to the above argument have been accumulated from widespread locations. Wynn (1970), from Australia, reported that coronary patients were more likely than controls to work many hours of overtime per week and were also more likely to hold more than one job simultaneously (Type A symptoms), and Bruhn, McCrady & du Plessis (1968) and Russek (1967) reported similar results in the United States. With regard to overtime hours, Russek, Thiel, Parker and Bruce (1973), and Theorell & Rahe (1971) confirmed the findings of Wynn.

One of the largest bases of evidence linking CHD with the TABP was the Western Collaborative Group Study (WCGS). Three thousand men, diagnosed as free of CHD, were followed for  $8\frac{1}{2}$  years after being identified as Type A or Type B (Rosenman, Friedman, Straus, Wurm, Kositchek, Hahn & Werthessen, 1964; Rosenman et al., 1970; Rosenman et al., 1975). The authors reported that the former had 1.97 (p <.001) times the rate of the latter with respect to new coronary disease which confirmed the earlier reports ( $2\frac{1}{2}$  year and  $4\frac{1}{2}$  year points) that the overt behaviour pattern is "prominent" among variables in the list of major risk factors. They stated "it seems clear that behavior pattern A indicates a pathogenetic force operating in addition to, as well in conjunction with, the classical risk factors" (p. 877). It was also reported that the TABP was associated

with greater risk of recurring and fatal CHD events, and that the reported incidence of CHD held for myocardial infarction and angina pectoris (Rosenman, Friedman, Straus, Wurm, Jenkins & Messinger, 1966; Rosenman, Friedman, Straus, Jenkins, Zyzanski & Wurm, 1970; Rosenman, 1971; Rosenman et al., 1975; Rosenman, Brand, Schultz & Friendman, 1976; Brand, Rosenman, Schultz & Friendman, 1976).

A second epidemiological prospective source of evidence for this link is the Framingham Heart Study (Haynes, Levine, Feinleib, Scotch & Kannel, 1978) which found that the incidence of CHD in males was 1.9 (p <.0006) and 2.1 (p <.0015) times greater for Type A compared to Type B men aged 39-49 and 50-59 years, respectively.

A third source of evidence for the association of the TABP and CHD was the Belgian Heart Disease Prevention Project (Kornitzer, Kittel, De Backer & Dramaix, 1981). It was reported that the association between the TABP and CHD was limited to angina pectoris patients and those with ECG abnormalities and a history of heart disease. Nevertheless, those with ECG abnormalities without angina or any history of heart disease also scored significantly higher on a subscale (related to speed and impatience) of the TABP measure.

Cooper et al. pointed out that the majority of research evidence is correlational in nature and does not imply causation. Lovalla & Pishkin (1980) pointed to an idiosyncrasy of the A/B dimension: that the extreme Type A pattern is not a better risk predictor than a less extreme Type A pattern. A possible explanation proposed by these

authors, which pointed to future research, is that the Type A population contains a sub-group which may be disease-prone. Howard, Cunningham & Rechnitzes (1976), on the other hand, reported that extreme Type As had a 50 percent greater risk of developing CHD according to the predictions of the "Coronary Risk Handbook". Both of these studies, however, point to the need to identify a coronary prone sub-group within the Type A population.

In agreement with this contention is a study of Scherwitz, Berton & Leventhal (1978) who separated Type A and Type B individuals according to the frequency of the use of personal pronouns. It was reported that Type As who self-referenced frequently had the highest systolic blood pressure (a known correlate of CHD) and that Type As who self-referenced the least had lower systolic blood pressure than either the first Type A sub-group or both Type B sub-groups. Lovallo & Pishkin suggested that Type As who are also extroverts exhibit greater central nervous system arousability and hence comprise a risk predisposing population.

To consider these and other factors, the Review Panel on Coronary-Prone Behavior and Coronary Heart-Disease (Cooper et al. 1980) was convened and with reference to this question stated:

Behavioral factors thought to be related to CHD are sometimes called Type A behaviour and at other times coronary-prone behaviour. This review panel questions the value of the general concept of a coronary-prone

behaviour pattern (CPBP) as it is interchangeably used with type A... The term CPBP should be reserved to denote whatever composite of behavioral manifestation is under consideration with respect specifically to its relationship to CHD. Thus, behavioral data can be discussed and assessed in their own right without reference to CHD, and their relationships to other health conditions can be freely explored. The term CPBP can be freed of any unnecessary restriction to the Type A behavior pattern, and other behavioral concomitants of CHD risk can be subsumed under this term as accumulating evidence may suggest (p. 1202).

The Belgian Heart Disease Prevention Project (Kornitzer et al. 1981), mentioned above, raised concern that the TABP may in fact be the outcome of CHD rather than comprise an antecedent risk factor. However, the authors stated that they expected that further carefully conducted prospective studies should verify that subjects exhibiting the TABP are prone to CHD. Nevertheless, at this point in time the TABP and the CPBP should be treated as separate entities although this is not to say that there exists no relationship between them. Indeed, the goal should be to refine the TABP until prediction of CHD reaches a maximum.

This study is directed towards this goal. It will consist of an examination of various risk factors, physiological and

psychological, associated with a specific high risk population and hence will be concerned with the refinement of the TABP. It is anticipated that at a later date this information will be compared to the incidence of CHD by longitudinally testing both the predictions of the TABP and the eight risk factors utilized in the Coronary Risk Handbook. To accomplish the primary goal literature will be reviewed concerning physiological and psychological factors which have been associated with the TABP. These factors will be considered with particular reference to the work place in the context of a "person-environment fit" utilizing Lazarus' (1966, 1971) model of stress. Prior to a discussion of these items, however, it is necessary to discuss the assessment of the TABP and the features that emerge from such an assessment.

#### Components of the TABP

In general terms analysis of Type A behaviour (Carver & Glass, 1978; Glass, 1977; Rosenman, Friedman Strause, Wurm, Kositchek, Hahn & Werthessen, 1964) has led to agreement that the following three features play a primary role: a) an enhanced sense of time urgency, b) excessive competitiveness and aggression, and c) an intense drive to succeed. These features are discussed below.

Time Urgency. Several experiments have demonstrated the Type A sense of time urgency. For example, an analysis of time estimates (Burnam, Pernebucker & Glass, 1973) indicated that Type As signalled the passage of one minute sooner than did Type Bs, both types

departing equally but in opposite directions from the accurate estimate. These authors viewed the struggle of As to overcome the constraints of time as stemming from an excessive drive to master as many aspects of their environment as possible. Similarly, Glass, Snyder, & Hollis (1974) compared the performance of Types As and Type Bs during a task involving differential reinforcement of low rates of responding. Type A subjects received a significantly lower percentage of total reinforcements than did Type Bs, indicating their tendency to respond too quickly. Another experiment demonstrated Friedman's (1969) contention that Type As exhibit irritation and anger when forced to slow down the rapid pace of their activities. Glass, Snyder, & Hollis (1974) had subjects engage in a discussion with a confederate of the experimenter in order to reach consensus on a series of decisions. The confederate deliberately slowed the discussion, and the conclusion was that Type A subjects, at least those who scored high on speed and impatience, were more impatient than Type B subjects when the activities of both were slowed down by another person. Even in speech patterns, Sparacino (1979) reported, "In keeping with their chronic sense of time urgency Type As are also said to more frequently hurry their conversational partner along by interjecting back channel feedback such as 'mm-hm' or 'yes, yes' or by nodding the head rapidly" (p. 41).

Competitiveness and Aggression. The results of Glass et al. (1974), described above, also provided evidence for the second com-



ponent of Type A behaviour -excessive competitiveness and aggression. Carver & Glass (1974) reported that Type As reacted with increased aggression to a threat to their sense of competence and mastery. No such increase occurred among the Type Bs and the two groups did not differ in their aggressiveness in the absence of threat.

Drive to Succeed. The third component of Type A behaviour, that of having an intense drive to succeed in achievement related activities (Glass, 1977), received support in an experiment which demonstrated that Type As tended to work at maximum capacity whether or not a time limit was present. In comparison, Type Bs worked at maximum effort only when there was an explicit deadline. Jenkins (1975) regarded this feature of Type A behaviour as a possible explanation of the prevalence of CHD in contemporary western society which rewards those who can think, perform and communicate more rapidly than their peers.

#### Assessment of the TABP

The first formal method of classifying subjects according to behaviour patterns was designed by Friedman and Rosenman (Rosenman et al. 1964). This and two other well known methods, The Jenkins Activity Survey for Health Prediction (Jenkins, Rosenman & Friedman, 1967) and the Framingham Type A Scale (Haynes, Levine, Scotch, Feenleib & Kennel, 1978) will be discussed in turn.

a. The Structured Interview (SI). A four point scale is used to analyse the content and behavioural style of subjects' responses

during a structured stress interview, as follows: A<sub>1</sub> - fully developed Type A; A<sub>2</sub> - incompletely developed Type A; B<sub>3</sub> - incompletely developed Type B; B<sub>4</sub> - completely developed Type B. There is also included a Type X which falls between Type A<sub>2</sub> and Type B<sub>3</sub> and accounts for 10% of the population (Friedman & Rosenman, 1974).

The subject is asked approximately 25 questions relating to intensity of ambitions, competitiveness, feelings of hostility and sense of time urgency. The questions are posed in a manner designed to create stress and hence, elicit signs related to the above factors. Of more importance than the actual answers, however, is the manner and tone of delivery. The subject's general appearance, his bodily movements, his explosive speech accentuations and inflections are the critical factors. The developed Type A typically speaks rapidly emphasizing certain words, he anticipates what will be said next, and hurries the interview with nods. The contents of his answers indicate a need for power, a need for recognition of his achievements, a compulsive attraction toward competitive situations, a compulsive need to "get things done", a tendency to be easily angered by others, and the belief that any obstacle can be overcome. He also appears to receive most gratification from his job and little gratification from other sources.

The Type B pattern of behaviour may include Type A characteristics but in less exaggerated form. The Type B individual feels less compelled by chronic time urgency and is generally more relaxed

and gesture free. He appears less easily aroused to anger and less inclined toward competitive situations (Glass, 1977).

In a test of reliability, Jenkins, Rosenman and Friedman (1968) reported that two trained judges rated the behaviour-pattern interviews the same way 84% of the time. The sample consisted of 75 cases drawn from a larger sample of 3,000. Caffrey (1968), in a study of 1,433 American Benedictine and Trappist monks, obtained 75% to 77.4% agreement between all possible pairs of three interviewers. Finally Jenkins (1968) reported a test-retest agreement rate of 80% when 1,064 males were examined twice - 12 to 20 months apart.

Factor analysis of the SI (Matthews, Krantz, Dembroski & MacDougall, 1982) yielded four independent factors: clinical rating of speech behaviour and self-reports of pressure drive, anger and competitiveness.

b. Jenkins Activity Survey for Health Predictions (JAS). The JAS - Form B is a self-report measure consisting of 54 questions similar to those used in the SI. Scoring is based on optimal weights predicting the SI classification of the large groups of middle-aged males (Jenkins, Zyxanski & Rosenman, 1971). The scores which were normally distributed were standardized to yield a mean of zero with a standard deviation of 10. Positive scores indicate the Type A direction and negative scores the Type B direction. Jenkins (1978) reported that the test-retest reliability of the JAS A/B scale was between .60 and .70 across 1-4 year intervals. Factor analysis of the JAS yielded

three major behavioural components: speed and impatience, job involvement, and hard-driving competitiveness.

c. Framingham Type A Scale. A third measure, the Framingham Type A scale is also a self-report measure which contains ten items that assess the individual's competitive drive, sense of time urgency, and perception of job pressures (Haynes et al., 1978). Items are weighted and summed to yield a total with those scoring above the median being labelled Type A and those below a Type B. Internal reliability was reported to be .70.

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Comparison of Measures of the TABP

The forerunner of all assessment methods was the SI, with the other two techniques evolving from it. Initially, the interview was used in the Western Collaborative Group Study and of the sample of 3,524 men approximately 50% were classified as Type A1 and A2 (Rosenman et al. 1964). Matthews (1982) observed that later studies (e.g. Howard, Cunningham & Rechnitzer, 1977) have placed the Type A percentage much higher, - at about 60%, and Cooper et al. (1980) have placed this estimate at up to 75%. Matthews noted that should this tendency continue large numbers of persons who will not develop coronary heart disease will be categorized as being at high risk. To this extent, the specificity of the interview for the prediction of coronary disease has generally weakened. The JAS, on the other hand, which was initially developed to imitate the results of the SI, has not shown this trend.

Although, as stated, all three measures appear to be reliable, the association among them is not impressive (Matthews, 1982). It was reported that the JAS and the Framingham Scale agree with the A/B classification as made by the SI about 60 - 70% of the time for middle aged white-collar and undergraduate men (Haynes, Feinleib & Kannel, 1980; Jenkins 1978; MacDougall, Dembroski & Krantz, 1981), which, as Matthews (1982) pointed out, is only 10% to 20% above chance. One reason given for the lack of consistency across measures is that speech behaviour is a prime component of Type A behaviour as measured by the SI but obviously not of the others. Matthews stated that such a component may not be a sensitive indicator; that is, it is possible for one Type A subject to interrupt frequently and report impatience whereas another may never interrupt but may show annoyance when questioned regarding the accuracy of his answers. "Thus psychometric imprecision may result because persons may be classified as Type As for different reasons" (1982, pp 300,301).

Matthews, Krantz, Dembroski and MacDougall (1982) investigated the differing results between the SI and both the JAS - Form B (discussed so far) and the JAS - Form T, an adaptation for students, and reported agreements of 67% and 63% respectively. To examine these low agreements (17% and 13% above chance) the SI was factor analysed and for both samples the following factors were identified:

- (1) pressured drive,
- (2) clinical ratings plus number of interruptions,
- (3) anger,
- (4) competitiveness.

Factor 2 was significantly related to the SI assessment ( $p < .001$ ) and it was suggested that the estimate of Type A can be predicted by promptness of response, voice emphasis, hurried speech - evidenced by both pace and interruptions - and judgments of hostility and energy level. Further, Factor 2 and the SI scores shared over 60% of their variance in common. It also contained two items not related to indications of speech: energy level and hostility, which were positively but moderately related to the JAS. Matthews et al. concluded that the common sources of variance of the SI and JAS was probably within the measures of self-reported pressured drive and judgments of hostility, competitiveness and energy level and the unique variance pertained to the subjects' speech behaviour and self-reported time pressure. The authors also suggested that the SI falsely classifies coronary prone individuals; therefore, as already stated, the terms TABP and CPBP should not be used interchangeably. Further the SI and JAS should not be used as interchangeable measures of the TABP.

Several recent studies have been reported which relate to the SI, the JAS and atherosclerosis in men. Blumenthal, Williams, Kong Schanberg & Thompson (1978) performed the first study in response to the United States Public Health Services comment that:

Stress and strain, especially of an emotional nature or for prolonged periods of time, may play a part in some heart attacks. Many medical men think, however,

that the role of such pressures probably becomes important only after already hardened arteries have created the setting for an attack (635).

These authors presented the alternate view that TABP plays a role in accelerating the atherosclerotic process itself. Obviously, resolution of this argument has implications for treatment for if the TABP is antecedent then the goal would be to reduce related behaviours rather than attempt to lower incidents of smoking and other traditional artery hardening processes. In order to resolve this argument the SI and JAS were compared with respect to incidents of cigarette smoking, blood pressure, mean aortic pressure, cardiac index and sympathetic nervous activity. The authors reported that atherosclerosis was associated with increased serum lipids and to the TABP. Severity of atherosclerosis was measured by the degree of occlusion and 44% of those with mild occlusion, 69% of those with moderate occlusion, and 93% of those with severe occlusion were classified as Type A according to the SI. On the other hand no such relations were found for the JAS. This study suggests that either the TABP and CHD are dependent on some third variable, or that the TABP as predicted only by the SI plays a role in accelerating CHD.

One other study (Frank, Heller, Kornfeld, Sporn & Weiss, 1978) agreed with the contentions of Blumenthal et al., however others have not found these results. Dimsdale, Hackett, Hutter, Block & Catanzano (1978); Dimsdale, Hackett, Hutter, Block, Catanzano &

White (1979); and Dimsdale, Hackett, Catanzano & White (1979) all failed to find any relationship between atherosclerosis and TABP as measured by either the SI or the JAS although these measures agreed with each other about 75% of the time. Dimsdale and associates, in their last experiment, suggested that population differences may account for their results and pointed to psychosocial variability as the compounding source. Zyzanski, Jenkins, Ryan, Flessas & Everest (1976), on the other hand, reported a positive relationship between JAS scores and coronary artery disease. More lately Krantz, Sanmarco, Silvester & Matthews (1979) examined the progression of coronary artery disease and methods of assessment in a longitudinal study. (The Blumenthal et al. study was cross-sectional.) The 67 subjects underwent repeated arteriography over a mean range of 17 months and completed the JAS either between angiograms or after the final one. A subset of 45 subjects was also given the SI and it was reported that the interview method was not related to progression but the JAS score was related ( $p < .03$ ). It was suggested that weaknesses in the associative power of the SI may have been caused by the small sample, the fact that the majority of subjects were Type A, or by the lessening of "stylistic" voice characteristics due to medication (e.g. beta-blockers, tranquilizers).

It is very evident, then, that the literature is equivocal concerning which is the most accurate tool for measuring coronary proneness. However, that the JAS was initially formulated with the inten-



tion of deriving the same outcome as the SI, does not necessarily mean that it relates less to CHD. To resolve this issue the unaccounted variance between the JAS and the SI should be compared to direct measurements of coronary artery disease and CHD. Such a comparison is beyond the scope of this study; however, Rosenman's comment that, "subjects' responses (to the the JAS) are often ludicrously inaccurate, particularly those reported by Type A subjects" concurs with those of Glass (1977) who stated "In contrast to Bs, Type As work hard to succeed, (and) suppress subjective states that might interfere with task performance" (p. 181). In other words the very fact that there is a difference between the SI and the JAS for certain subjects might have implications for the prediction of CHD. Type As on paper and pencil tests would be expected to deny being attributed with interfering factors such as those which examine the "approach to life" (see JAS, Question 46).

Closely associated to the third component of the TABP is the suggestion (see above) that Type A individuals, in order to succeed and hence master their environment, must deny or suppress subjective states such as fatigue. (Carver, Coleman & Glass, 1976; Walster & Aronson, 1967). It is contended that suppression of these states aids in the maintenance of control but may increase the risk of CHD in Type A individuals. A brief review of relevent research follows.

Walster & Aronson (1967) reported that persons expecting a task to be relatively lengthy in time tended to suppress feelings of

fatigue; further, Snyder & Glass (1974) reported that Type As exhibited greater suppression than Type Bs. The results, however were confounded by differences between the groups in pre-test fatigue; therefore, Carver, Coleman & Glass (1976) replicated the general concept. College students were required to complete a Balke treadmill test at a walking rate while rating their fatigue at two minute intervals. Subjects also completed a similar test at a running pace in order to assess maximum aerobic capacity. Both aerobic capacity and performance were determined by analysis of expired air, and walking performance was scored as a proportion of maximum aerobic capacity.

Type As, although exerting greater effort, clearly suppressed feelings of fatigue to a greater extent than Type Bs. Glass (1977) stated, "In contrast to Bs, Type As work hard to succeed, (and) suppress subjective states (e.g. fatigue) that might interfere with task performance" (p. 181).

The contention that Type As tend to suppress feelings of fatigue is significant, especially within the context of Green, Moss & Goldstein (1974), who proposed the following three steps which should be taken by an individual experiencing CHD. First, the symptoms should be perceived; second, their seriousness should be recognized; and third, the need for immediate care should be realized. Carver et al. (1976) stated, "Type As may be less perceptive of early heart attack or preheart attack symptoms than Type Bs. This seems especially reasonable in light of the observation (Green et al., 1976

p. 151) that 'the longest and most frequent prodromal symptom with reference to myocardial infarction is ... fatigue ... tiredness ... having to push (oneself)'" (p. 465). They concluded, "It is not unlikely that fatigue suppression, characteristic of the Type A even as a young man, may be an important factor contributing to greater susceptibility to coronary artery disease in later years (p. 165).

Glass (1977) suggested that these behaviours represent an attempt by the Type A individuals to obtain and maintain control over stressful aspects of the environment. Typically the Type A will initially struggle to control the event in a hard-driving, aggressive and competitive manner becoming annoyed at times. However, if such efforts are unsuccessful he will give up and act helpless: "In sum, the uncontrollability approach suggests that Type A behaviours reflect a specific way of coping with stressful aspects of the environment" (Matthews, 1982, p. 308). More recently Glass and colleagues (Glass, Krakoff, Contrada, Hilton, Kehoe, Mannucci, Collins, Snow & Elting, 1980) emphasized the person/environment interaction:

It has been observed, however, that Type A behaviour is elicited primarily in the presence of appropriate environmental circumstances such as challenges and stresses. Indeed, the behaviour pattern is regarded as the outcome of a person-situation interaction, in which an uncontrollable stressor, or the challenge of task performance produces competitiveness, impatience and

hostility in predisposed individuals (p. 453).

Also, Rosenman & Chesney (1980) perceived "control" to be a central theme of the Type A. The "TABP is a characteristic style of response to environmental stressors that threaten an individual's sense of control over the environment" (p. 4). Prior to reviewing the pertinence of controllability to CHD, physiological correlates of the TABP and CHD and their possible relation to concept of control will be reviewed.

#### PHYSIOLOGICAL CORRELATES OF CHD AND THE TABP

This section will describe certain physiological correlates of CHD and the TABP, presenting data which suggests that the two may be related. It will also present arguments why cognitive style may mediate these physiological events, particularly those involving serum cholesterol levels, tryglyceride level and blood pressure.

Several studies have attempted to identify physiological correlates of CHD. For example, Henry, Ely & Stephens, (1972) have reported that mice subjected to confrontation with other mice in order to obtain food developed hypertension and increased coronary arteriosclerosis associated with increased levels of enzymes which synthesize the neurotransmitters of the sympathetic nervous system. Lamprecht, Williams & Kopin (1973) have shown that chronically immobilized rats developed hypertension which was associated with serum levels of dopamine-beta-hydroxylase, the enzyme that synthesizes the sympathetic neurotransmitter norepinephrine. In human subjects,

Friedman (1977) has observed that, "Type A subjects, while not suffering from any fixed error in the metabolism of either epinephrine or norepinephrine, nevertheless secrete more norepinephrine during working hours and also during any individual competitive activity than Type B subjects" (p. 598). These findings were confirmed by Carruthers (1969); Hames, Lightman & McDonough (1965); and Nestel, Verghese & Lovell (1967). The latter two studies indicated that the majority of coronary prone subjects and the majority of those already suffering from angina pectoris excreted an excessive amount of catecholamines. Further, Friedman, St. George, Byers, Rosenman (1960) reported that Type As showed a greater increase than Type Bs in blood or urinary catecholamines when challenged by the stress of an ordinary working day. Friedman, Byers, Diamant & Rosenman (1975) assayed plasma norepinephrine and epinephrine in Type A men under resting, non-competitive conditions, and also immediately before, during, and after participation in a non-physical competitive struggle. They reported no differences in concentration of catecholamines in the two groups under resting conditions but under competitive conditions, norepinephrine concentrations rose about 30% with the Type A group, compared to no change with the others. Epinephrine concentration remained unchanged in both groups.

Dembroski, MacDougall, Shields, Petillo, & Luschene (1978), and Manuck, Craft & Gold (1978) have shown that Type A subjects compared to Type Bs responded with significantly greater blood pressure

and heart rate increases when challenged to perform at maximum capacity in a choice reaction time task and tasks requiring problem solving skills. Dembroski, MacDougall, Herd & Shields (1979) summarized the general findings in this area:

Biochemical and cardiovascular responses exhibited by Type A subjects are indicative of enhanced sympathetic nervous system action, which has the potential to damage the cardiovascular system. If research can firmly establish a link between Type A behaviour and excessive sympathetic arousal, a valuable lead will be established into the mechanism through which behaviour may excite pathogenic processes in CHD (p. 211).

The search, then, for sympathetic involvement in CHD has continued since the Dembroski et al. comment. For example, Van Doornen (1980) after examining psychological and psychophysiological factors stated "The mediating mechanism between these characteristics [of the coronary prone personality] and infarction risk is possibly sympathetic (re)activity" (p. 213, 214); McCranie et al., (1981) argued that non-symptomatic Type As have also been found to exhibit a number of potentially pathologic biochemical and cardiovascular characteristics (elevated serum lipids, and greater blood pressure and heart rate increases) in response to various cognitive, psychomotor, and interpersonal challenges. The current interpretation of these findings suggests that chronic sympathetic nervous system overactivity is

responsible and may provide the physiological link to CHD.

Sympathetic reactance is also suggested as a possible intervening mechanism by Williams, Kuhn, White & Schanberg, (1982); Williams (1975); and Malcolm, Janisse, & Dyck (1983).

Rosenman & Chesney (1980) indicated that there also exists a link between the central nervous system (CNS) and atherogenesis which is probably associated with effects on lipid metabolism. Gunn, Friedman & Byers, (1960) performed research which indicated that chronic stimulation of the ventromedial nucleus of the hypothalamus of cholesterol-fed rabbits caused hypercholesteremia. Friedman, Byers & Elek (1969) demonstrated that hypercholesteremia is induced in rats by bilateral injury to the ventral medial nuclei, fornices and the lateral hypothalamic nuclei.

To summarize, evidence has been presented for the involvement of the SNS via the secretion of the catecholamines and the CNS via the metabolism of serum lipids in the pathogenesis of CHD. Complicating the matter still further, is a possible SNS/CNS interaction. J. Haft (1974) stated:

An interesting aspect of the relationship of catecholamines and atherosclerosis has been noted by Anitschkow. He found that the combination of adrenalin injection and cholesterol feeding enhanced the production of atherosclerotic plaques in the experimental animal although the location of the lesion was more

typical of adrenalin sclerosis. He considered these changes to be secondary atherosclerotic lesions; similar to the cholesterol infiltration occasionally seen in syphilitic aortas and not related to primary atherosclerosis as usually seen in humans. It is likely that degenerative changes in the vessel wall induced by catecholamines predispose to the infiltration of the wall by lipids. (p. 82)

It is evident that several physiological mechanisms are involved in CHD and evidence has been presented that the catecholamines may act by predisposing the arteries to infiltration by cholesterol and other lipids. These mechanisms have been linked by Matthews (1982) to attempts to maintain control by Type A individuals: specifically, coping with some stressor causes increased SNS activity inducing the discharge of catecholamines (Weiss, Stone & Harrell, 1970) which in turn causes increases in blood pressure and accelerates the rate of arterial damage, induces myocardial lesions, and facilitates the occurrence of fatal cardiac arrhythmias. These catecholamines, however, also predispose the aggregation of blood platelets - non-nucleated disks associated with the process of blood clotting and hence thrombosis, (Ardlie, Glew & Schwartz, 1966). Further, a series of events is initiated which results in the metabolism of free fatty acids which, when taken up by the liver, form tryglycerides, one form of which (very-low-density lypoprotein) is positively related to CHD



(Herd, 1978).

In light of the above observations it is not surprising that it has often been suggested that research should be aimed at identifying those Type A individuals who are, in fact, coronary prone (Lovallo & Pishkin, 1980; Matthews, 1982; Matthews & Saal, 1978). In this regard House (1974) argued that it will only be when all variables that mediate and/or condition the relationship between objective social conditions and health outcomes are explicitly conceptualized and measured that an adequate understanding of the effect of social stress of heart disease will be available. The present study concurs with the reviewed data which suggests that the TABP does not provide an adequate description of the CPBP and argues that the reason for this is two fold. First, measurements of the TABP (the SI and JAS) involve relatively independent factors, all of which may be related via physiological mechanisms to CHD. Which of these factors is operative at any time, however, varies with the situation and person. Therefore, the person/environment must be considered. Second, the TABP is global and does not take into account differences between sub-populations, e.g. white collar workers vs blue collar workers. It is contended, then, that the TABP is elicited in certain individuals when stress is adequate, which in turn depends on the stressor and the individual's own tolerance. The latter is proportional to the subject's perception of his ability to maintain control in the face of stress.

CONTROLLABILITY AND THE TABP

Stress and Controllability in relation to Lazarus' (1966) Model

Glass' comments, above, are in agreement with Lazarus (1966) who stated "The important role of personality factors in producing stress reaction requires that we define stress in terms of transactions between individuals and situations, rather than of either one in isolation" (p. 5). The relationship of stress to CHD has been noted several times. Stressful life events, job dissatisfactions, economic frustrations and excessive work and responsibility have all been linked to CHD (Jenkins 1971; House 1975), and can contribute to CHD through the body's general reaction to aversive stimulation (Glass, 1977 b).

Lazarus' model of the stress reaction is pertinent to the TABP in that it places the need for control into perspective and hence has implications for alleviating uncontrollable situations. Examining the characteristics of stress stimuli (Janis 1958, Basowitz, Persky, Korchin & Grinker, 1955; Grinker & Spiegel; Bettelleim, 1960; Cantril 1947; Lindmann, 1944) Lazarus observed certain common factors:

..... the most important values and goals of the people observed were endangered or disrupted.

Sometimes, as in the case of the concentration camp, every vestige of hope for a return of those values and goals was eliminated. There was great uncertainty about physical survival, the maintenance of identity,

the ability to control one's environment even a little,  
and the opportunity to avoid pain and privation (p. 6).

With respect to reactions to stress he pointed to four main categories: (1) "Disturbed affect", in which the responses may involve anger, aggression or depression for example - patterns surprisingly similar to those of the Type A after a threat to controllability, (Friedman & Rosenman, 1974) followed by eventual giving up and depression (Matthews, 1982); (2) "Changes in motor behaviour", which include speech disturbances (Mahl, 1956) - a prime symptom of the TABP as elicited by the SI; (3) "Changes in the adequacy of cognitive functioning" in order to cope, which evolve into a misinterpretation of reality - remarkably like the observation (Matthews, 1982) that Type As continue to combat the threat by useless means prior to giving up; and (4) "Physiological change", which includes "both the autonomic nervous system as reflected in end-organ activity of the heart, respiratory organs, sweat glands etc. and of the adrenal glands which secrete various hormones under stress" (p. 8). Also involved are corticosteroids, epinephrine and norepinephrine - again such responses are often found to a greater degree in Type A individuals (Friedman, 1977).

Summarizing his introduction to the topic of stress Lazarus pointed to three central issues: (1) conditions and processes that determine when stress reactions will be produced; (2) the consequences of a stimulus being perceived as stressful; and (3) patterns of reac-

tion that define the presence of stress. To examine these issues a model of "stress" was defined. First occurs the threat which causes the individual to anticipate a confrontation with a harmful condition. Whether or not a particular stimulus is considered threatening depends on a cognitive process labelled "primary appraisal". Lazarus argued that this process depends on factors in the stimulus configuration such as the "power to harm" relative to the "counter-harm" resources, the imminence of the confrontation and the degree of ambiguity in the significance of the stimulus cue. Primary appraisal also depends on "factors within the psychological structure of the individual, including motive strength and pattern, general beliefs about transactions within the environment, intellectual resources, education and knowledge" (p. 25). The present study contends that "psychological structure" relates to the individuals resources for maintaining control (motive strengths, intellectual resources, education and knowledge), and that his cognitive style has implications for the interpretation of stimulus configuration, particularly concerning the harm/counter-harm balance. Measures pertaining to the latter include the Embedded Figures Test of Field Dependence (Witkin, Ottman & Raskin, 1971) and the Locus of Control Test (Rotter, 1966); Levenson, 1973, 1974, 1975).

These concepts, Locus of Control and Field Dependence, will be related to the TABP in a later section. Suffice it to say for the moment, however, is that responses to stress, as described by Lazarus, are evidently related to the TABP since "degree of ambiguity" and

situations of salient threat (harm & counter-harm) have both been found to elicit greater physiological arousal in Type As compared to Type Bs (Carver, Coleman & Glass, 1977).

After primary appraisal has determined that a threat exists, coping processes are set in motion. These processes depend on cognitive activity which Lazarus termed "secondary appraisal". As with primary appraisal, secondary appraisal depends on the degree of threat, factors related to stimulus configuration and individual resources. Literature reviewed throughout this study has indicated that Type A coping strategies differ from those of Type Bs on the basis of individual resources. The concept of the TABP gains support, then, from Lazarus' model, not because there is some single entity which dichotomizes the populations, but because combined facets of personality (resources) result in certain response patterns. In other words, there are many possible combinations of personality dimensions which can result in the TABP, and as already suggested, some of these may be related to the onset of CHD. This study, then, will in part examine one such resource - controllability - and compare it to the AB dimension, to coronary proneness, and to the predictions contained in the Coronary Risk Handbook. To accomplish these comparisons a sample of middle- and senior-level executives will be utilized, and as such it is appropriate to examine those stressors that are related to control within their environment.

Control, Stress, Personality and the Work Place

Keenan & McBain (1979) completed a study which related uncontrollable items such as role conflict, role ambiguity and role overload to various personality measures and the TABP. They described role ambiguity as occurring when there is insufficient information to carry out a job adequately; role conflict as occurring when the information is conflicting rather than insufficient; and role overload as occurring when the individual is "faced with a set of conditions which, taken as a set, require him to do more than he is able in the time available" (Sales, 1969 p. 325). It was argued that not only is the absolute amount of role conflict a major factor but so is the perceived conflict. That is, high role stress may or may not result in psychological strain, depending on the personalities of the individuals concerned. Thus Caplan & Jones (1975) found that the relationship between workload and anxiety was greater for Type As than for Type Bs. This does not suggest that the TABP is a personality dimension per se, rather only that it is associated with other known personality measures, for example to Eysenk's (1967) Introversion/Extraversion dimension, and Petries (1967) Stimulus Intensity Modulation (Janisse, Dyck & Malcolm 1982), as well as to Rotter's (1966) Measure of Locus of Control (Keenan & McBain, 1981) and Witkin & Goodenough's (1979) Field Independence/Dependence (McCranie, Simpson & Stevens, 1981). In other words, as argued previously, the personality measures typically found in Type As may result in

different appraisals to threat and different coping strategies, the physiological effects of which represent the intervening link in the purported association between the TABP and CHD (Sales, 1967).

In this context Keenan and McBain examined the TABP, intolerance to ambiguity and Locus of Control under the stressors of role ambiguity, conflict and overload. They predicted that the amount of role stress in the form of overload experienced by Type As would be greater than that experienced by Type Bs, and that this stress would be related to job dissatisfaction. Predictions regarding role ambiguity, conflict and the TABP dimension were limited to the prediction that Type As or Bs who were intolerant of ambiguity would react more adversely in terms of increased tension and lowered job satisfaction.

Pertinent to the present study was the use of Rotter's (1966) Locus of Control scale which measures the tendency to believe that environmental events are within personal control as opposed to being controlled by luck or fate. Internals believe that control is self administered and therefore employ behaviours designed to gain mastery over the environment, whereas externals believe that outside forces have control and hence feel relatively helpless. Organ & Greene (1974) had previously reported that internals perceived less role ambiguity than externals, but Keenan and McBain observed that "there seems to be no compelling theoretical reason for expecting that perceptions of role ambiguity would be affected by locus of control orientation" (p. 279). Intuitively, however, it would seem reasonable

for internals to take steps to reduce ambiguity and hence perceive less of it.

It was reported that role ambiguity but not role conflict was significantly correlated with both tension and job satisfaction and that role overload was positively associated with tension but not with job satisfaction. The TABP was, as expected, significantly and positively related to perceived work overload, but not to tension or satisfaction, and Locus of Control was not significantly correlated with perceived role ambiguity. There was no significant interaction between the TABP and Locus of Control, Type As did not report differences in job overload, dissatisfaction or tension in comparison to Type Bs; however, as predicted there was a significantly stronger association between role ambiguity and dissatisfaction for Type As compared to Type Bs. Referring again to Locus of Control, both internals and externals reacted to ambiguity with lowered satisfaction but only externals showed increased tension when ambiguity was high. This is consistent with the intuitive observation made earlier. That is, possibly the internals felt capable of ultimately controlling ambiguity and hence did not feel tension.

The authors, however, essentially devised their own AB scale. If the JAS or the SI had been used results may have been different and perhaps might have explained why lower scoring As have been found to have a higher incidence of CHD than extreme As (Lovallo & Pishkin, 1980). If extreme As are also "internals" then control may not be so readily perceived as having been lost; that is, it may be "external"



Type As only who have a tendency to perceive things as being out of their control and who therefore are in danger of CHD. On the other hand, even for internals, situations where personal control is lost may occur. Therefore it may be that under such conditions (extreme stress) internal Type As are at double jeopardy. That is the demands of both their internal and Type A characters are frustrated thus creating a danger of CHD.

Howard, Cunningham & Rechnitzer (1977) completed a similar study, especially relevant because subjects were managers within twelve Canadian industries. These authors utilized the SI to differentiate As and Bs and, as is typical at the present time, 60% of the subjects were classified as Type As and the fully developed (A1) type was more prevalent in the 36 to 55 year old group. It was reported that generally the Type A1 put in the longest work week, worked more discretionary hours per week and travelled more. These differences were not significant for all Type As. There were no significant differences for job satisfaction according to the Job Descriptive Index (Smith, Kendall & Hulin, 1969). Thirty-one items obtained from Job Tension Index (Kahn, Wolfe, Quinn & Snoek, (1964) and private sources were used to obtain information on ambiguity, feelings of being locked in, stagnation, isolation and contentment. Type As scored low on the factors "locked in" and "contentment" in comparison to Bs, otherwise there were no significant differences. Also of interest is that for "contentment" and "stagnation" A2s showed lower values than A1s. The authors commented that "contentment" represents

feelings of personal confidence and therefore represents personality more than job conditions. Hence, if it is assumed that a lack of personal confidence results in a lack of control then indeed it might be expected that, as reported, A2s would be less content. However, as stated above, Howard et al. reported that A1s were at greater risk of developing new CHD according to the predictions of five of the seven risk factors the Coronary Risk Handbook. Data concerning glucose intolerance and ECG abnormalities were not available. It is evident, then, that identifying either A1s or A2s as being coronary prone may be overly simplistic.

A more recent study performed by Ivanevich, Matheson & Preston (1982) was based on the work of Theorell (1974) and Theorell & Rahe, (1972) who indicated that patients who had survived a myocardial infarct responded with brain waves and electrocardiogram arrhythmias high enough to produce another heart attack only when the topic of work was mentioned. Ivanevich et al., then, examined the "person-environment" framework with respect to two groups, managers and nurses, and referring to Lazarus (1966), argued that primary appraisal may result in the conclusion that the situation is harmful, disgusting or challenging, thus causing stress which can be described as the lack of a person-environment fit. They proposed that top level managers would report the highest degree of stress, lower job satisfaction and the poorest indicators of physical well-being, and that Type A managers would report greater degrees of these measures than Type Bs. The research was repeated with nurses with the hypothesis

that the described measures would be greatest for Type As who are involved in life and death situations - operating room staff. Again, however, the A/B differentiation was made on the basis of an eight-item scale drawn from other scales (Bortner, 1969; Caplan, 1971; and Jenkins, 1978), therefore it is difficult to compare these results with those of other studies. An index of Job Satisfaction was utilized and, of particular interest to the present study, various physiological measures were taken: serum cholesterol, systolic and diastolic blood pressure, percentage body fat, and triglycerides. As was reviewed in an earlier section, all are generally accepted measures of the risk of CHD. (Dawber & Kannel, 1961; Friedberg, 1966; Gordon & Verter, 1969; Keys, Taylor, Blackburn, Brozek, Anderson & Simonson, 1971).

The results were in general agreement with Marshall & Cooper (1978) and indicated that middle level managers reported significantly more stress than did lower and upper managers on four measures: quantitative work overload, lack of career progression, supervisor relations, and role conflict. The TABP was reported to be a significant moderator with Type As being more adversely affected by quantitative workload. There was a stronger association between lack of career progression and intrinsic satisfaction, role conflict and intrinsic satisfaction, and role conflict and systolic blood pressure for Type As than for Type Bs. Contrary to expectations there were no other significant differences on various physiological measures between Type As and Type Bs. The authors pointed to two confounding

factors: the first is that perceived conditions may not coincide with actual conditions and the second refers to the fact that work overload may be self-imposed.

The second part of the study which utilized the sample of nurses attempted to resolve the first of these questions. The SI was utilized as well as a 32-item self report scale. Significant differences between operating room nurses and the supposedly less stress bombarded medical-surgical nurses involved quantitative work overload and time-pressure stress, and the latter group reported greater amounts of both. When the A/B dimension was included (as determined by the SI) it was reported that the TABP "was a much greater moderator of association and differences than was the speciality of nurse - operating room or medical-surgical" (p. 386). Pertinent to the present study, it is contended that work overload, lack of career progression and role conflict are all indices of a lack of control over factors affecting well-being. The results of Ivanevich et al., then, indicate that controllability may be an independent risk factor to be considered in conjunction with the TABP.

An ambitious study by Shirom, Edan, Silberwasses & Kellerman, (1973) utilized 762 male kibbutz members aged 30 years and older to examine relationships between CHD, abnormal ECG readings and, traditional CHD risk measures and occupational stress. Pertinent here, role conflict was found to correlate with CHD for white collar workers. Cooper & Marshal (1978) discussed several studies related to organizational structure and climate which have a direct impact on

the issue of control, the hypothesis being that the greater the individual's participation in the management process the greater would be his perceived sense of control of his own destiny. French & Caplan (1970) stated that those who participated in decision making reported more job satisfaction, less job-related feelings of stress, and greater feelings of self esteem. Conversely, those who reported being under the most pressure indicated that their supervisors 'always ruled with an iron hand' (Buck, 1972). Margolis, Kroes & Quinn (1974) reported that non-participation was the most significant prediction of job related stress and that it was related to:

"overall poor health" ( $r = 0.08$ ), escapist drinking ( $r = 0.06$ ), low job satisfaction ( $r = 0.34$ ), low motivation to work ( $r = 0.48$ ), intention to leave job ( $r = 0.22$ ) and absenteeism ( $r = 0.11$ ).

The impact of uncontrollability on the TABP has for the most part been discussed indirectly, via role conflict and job ambiguity for example. Other studies have directly manipulated controllable/uncontrollable situations and observed the effect on Type A and Type B individuals.

Glass (1977) described research which directly examined the hypothesis that Type As will initially strive to regain control once it is lost. It was argued that improved performance following an uncontrollable event relative to after a controlled event is indicative of an effort to regain control, whereas a poorer performance is indicative of giving up. This hypothesis was part of the overall

theory that Type As when threatened by an uncontrollable stressor initially increase their efforts to assert control, but eventually, if failure continues, give up. In other words, uncontrollability may be defined as "the perception of a noncontingency between responding and reinforcement [and]...The initial reaction of Type As to an uncontrollable stressor may be deemed hyperresponsiveness...When he becomes concerned of his lack of control the Type A will cease trying to master his environment and show hyporesponsiveness compared to his Type B counterpart" (p. 72,73). Early experiments (Glass, 1977) tended to confirm this hypothesis and later ones refined it. Specifically, salience of the threat was recognized as a consideration, where salience was defined as "those stimulus or stimulus-field properties which compel or attract a subject's attention" (p. 102). In light of the Type As intense drive to succeed, threats in the work place would be particularly salient.

Glass posed the question as to why Type As and Type Bs show differential response patterns to cues of high and low saliences, and pertinent to this study, argued that the latter have lower expectancy of control - in other words they may be externals. Glass examined this hypothesis as follows: A sample of 275 male undergraduate subjects completed Rotter's (1966) Internal-External Control Scales (IE) and scores were obtained for the full scale as well as for a "Personal Control Factor" (Gurin, Gurin, Lao & Beattie, 1969; Mercelay 1970) which related to mastery over ones life. He reported that the JAS was

directly related to the I-E scale ( $r = -0.17$ ) as well as to the Personal Control Scale ( $r = -0.17$ ,  $r = -0.19$  respectively). Although the probability levels associated with these correlations ( $p < 0.001$ ) were high Glass maintained that the coefficients were too low for firm conclusions. Evidence indicates that the TABP is inversely associated with age (Shekelle, Schoenberger & Stamler, 1976), therefore it would be useful to obtain correlations from an older group rather than from students - one purpose of the present study.

Related to personality differences is a study by Brunson & Matthews (1981) which concluded that some Type As may lose faith in their ability to exert environmental control. The authors presented the argument that Type As and Bs use different cognitive strategies in problem solving situations. Failure on moderately salient tasks causes Type As to doubt their own ability and hence lose control, whereas Bs attribute failure to luck and task difficulty. Brehm (1966) suggested that a threat to personal freedom - obviously salient - arouses a motivational state termed "reactance" which attempts to restore freedom. One "reactance" strategy is to change one's opinion to a position advocated by a coercive communication. It was argued that Type As should show more resistance than Type B to such communications because it would cause them to feel threatened due to the loss of control. Results of three studies by Carver (1980) confirmed this hypothesis.

Matthews (1982) indicated that central to the uncontrollability

approach to the TABP are studies concerning physiological and neuroendocrine processes that accompany efforts to control. Again it is emphasized here that such processes may provide the link between the TABP and CHD.

McCranie, Simpson & Simpson (1981) argued that despite the general consistency of findings which suggest that chronic sympathetic nervous system overactivity among Type A individuals may offer the physiological link between the TABP and CHD, the fact remains that only a small portion of this population actually develop the symptoms. They, in accordance with the position of this research, attributed this fact to individual differences including those related to cognitive information processing, and stated:

As suggested by Williams (1975), directing attention to modes or styles of cognitive information processing may be particularly relevant in this regard, based on evidence that individual differences are significantly associated with sympathetically mediated cardiovascular functioning and lipid metabolism (p. 108).

One widely studied cognitive style, is the previously mentioned, Field Dependence/Independence dimension. (Witkin et al., 1979), defined as "the degree to which individuals function autonomously of external frames of reference in perceiving and processing environmental stimuli" (McCranie et al. 1981 p. 108). Those who utilize internal frames of reference are said to be field independent and



those who utilize external ones are field dependent. Similarities are noted to Rotter's Locus of Control dimensions. Research has indicated that Field Dependent individuals have less of a separate identity, prefer social interaction and are more concerned by social cues and information provided by others (Witkin & Goodenough, 1977), and physiological reports indicate that they tend to have higher basal levels of galvanic skin response (e.g. Goldstein, Pardes, Small & Steinberg, 1970), have greater levels of free fatty acid (McGough, Silverman & Bogdonoff, 1965) and higher levels of serum cholesterol (e.g. Flamanbaum & Anderson, 1978). These findings suggest that Field

Dependence/Independence may interact with the TABP. Scherwitz, Berton & Leventhal (1978) reported that Type A individuals who were assessed during the SI as using a low frequency of self referencing (personal pronouns) compared both to high self-referencing Type As and both sub-groups of Type Bs exhibited higher systolic and diastolic blood pressure and a moderately lower heart rate. This pattern was reported as remaining constant when measured at rest, during the SI and during a task involving the relation of memories to past episodes of anger and distress. Field Dependent individuals were also found to have a linguistic style which involved a relatively greater use of personal pronouns, inferring that Field Dependent (self referencing) Type As do have physiological responses which have been linked to CHD.

Based on the reviewed research McCranie et al. hypothesized that individuals possessing a Field Dependent cognitive style in com-

ination with Type A behaviour would exhibit higher levels of serum cholesterol and tryglycerides than would Field Independent Type A individuals. Low-density lipoprotein (LDL) cholesterol and high density lipoprotein cholesterol (HDL) content were also examined. One hundred and twelve medical students (92 males and 20 females) completed both the student version of the JAS and the Group Embedded Figures Test (GEFT). Six months later 65 males and 17 females were screened for the described physiological measures. It was reported that for both males and females Field Dependent Type As exhibited a higher mean total cholesterol value than the Field Independent Type A subgroup. The reverse occurred among the Bs with Field Dependent individuals having less cholesterol than the Field Independent group. When sex was included the highest level of cholesterol was found in male Type As who were Field Dependent. Similar but non-significant findings were reported for tryglycerides. In general the results supported other studies (Frances, 1979) and provided evidence for associations between the TABP, field dependence and enhanced sympathetic arousal. The authors suggested one reason for such results is that Field Dependent Type A subjects are more self-aware and hence may be relatively more concerned with comparing and evaluating their behaviour and performance with others, causing a more chronic arousal when interpersonal challenges are perceived. A second interpretation offered was that Field Dependent individuals perceive their environments as being controlled externally, hence they must be continually

on the alert for threats from the outside. Field Independent individuals, on the other hand, are more confident and self assured, and are capable of control of their destiny. Nevertheless, as stated previously, it may be that Field Dependent As are at severe risk when the perception of internal control is lost in conditions of excess stress.

One other measure which has been investigated with respect to the TABP and which may be related to controllability is trait anxiety. Its relationship to CHD has been suggested in the past (e.g. Bruhn, Chaneller & Wolfe 1969; Zyzanski, Jenkins, Ryan, Plessas & Everist, 1976) although others have disputed this association (Blumenthal, Thompson, Williams & Kong, 1979). More recently, Nielson & Dobson (1980) investigated trait anxiety and the TABP as measured by the JAS-Form T (student version). They reported non-significant negative correlation between the JAS and the STAI-trait version (Spielberger, Gorsuch & Luschene, 1970), between the JAS and the Multiple Affect Adjective Check List (Zuckerman & Lubin, 1965) and between the JAS and the interpersonal scale of the S-R Inventory of General Trait Anxiousness (Endler & Okada, 1975). Nielson & Dobson interpreted this result as "providing strong support for the hypothesis that the CPBP as measure by the JAS is a construct orthogonal to trait anxiety" (p. 547). Two issues may be disputed with regard to this conclusion. The first, already alluded to, pertains to the assumption that the TABP and the CPBP are one and the same, and the second refers to paper and pencil measures of trait anxiety. On such inventories it may be

that Type As would deny anxiety - a subjective state that may be perceived as interfering with performance. If this were the case then both anxiety and the tendency to deny may be associated with the TABP. Further examination of this issue might be possible by comparing trait anxiety and the sub-scales of the JAS. A final methodological issue in the research of Nelson & Dobson pertains to the age group contained in the sample. The TABP may not be as fully developed as in an older group, hence effects may not be as apparent.

#### Controllability - a summary

The need for control was linked to the TABP via the drive of Type As to cope successfully with their environment. In this regard Price (1980) explained the acquisition and maintenance of Type A behaviour utilizing a cognitive social teaching model. She indicated that the Type A behaviour helps individuals cope with stress and anxieties developed through socialization. For example, Burke (1982) suggested that "Attempting to dominate (i.e. control) one's environment through extreme competitiveness and aggressiveness might result from a belief that 'nice guys finish last'". (p 972) Burke examined this issue and reported that individuals scoring higher on Type A (JAS) also had higher expressed control needs and lower wanted control needs. Further, those scoring higher on the JAS - Speed and Impatience sub-scale also had higher expressed control. It was contended then, that in order to succeed such individuals must master or control their environment. This need was related to Lazarus' (1966) model of stress and it was argued that maintaining control was a coping mechanism. Data were pre-

sented which suggested that the need for controllability was a personality dimension (Rotter, 1966; Levenson, 1973) with some individuals being internal (perceiving control as being within their own repertoire) and others being external. The literature reviewed examined the relationship between the need for control and the TABP from two perspectives: directly, by means of experimental manipulation; and indirectly, by assuming that the existence of role conflict, job ambiguity and discontentment, for example, represented a loss of control. The direct measures offered considerable support for the contention that, generally, Type As react differently than Type Bs when control is removed - Type As appear to use an internal cognitive style (Glass 1977). The indirect examinations were equivocal in their results, and it was suggested that this may be due to the interaction between the TABP and Locus of control, with either external Type As (i.e. those who give up sooner) or internal Type As who are forced to give up being at the highest risk of CHD.

#### STRESS AMONG EXECUTIVES

This introduction commenced with examples depicting the cost of CHD to the western world, particularly to North America, and it was stated that those at the greatest risk are males between the ages of 35 and 50 years, especially those in managerial positions. A variety of research, some of which will be reviewed here, has attempted to link the TABP to CHD within this population and, bearing in mind the theoretic issue discussed related to stress, it does seem likely that such individuals operate in an environment favourable to the develop-

ment of CHD - the work place. With respect to the TABP, Friedman (1960) emphasized that it is the sustained interaction of personality and socio-economic criteria that cause its elicitation, and various studies which have been reviewed have mentioned the person/environment fit. In the context of this paradigm Mettlin (1976) examined "situational pressures" or "suitable environments" for the development of the TABP within the work place, specifically demographic and socio-economic status, status attainment at place of employment, work related interpersonal influences and status change and mobility. The results indicated that the TABP is related to status and economic attainment, in other words to "the drive to succeed". With regard to interpersonal influence it was reported that "Where a respondent perceived his employer as having high expectations for the quality of work performed, the quantity of work done, and the competitiveness with which he approached his job etc, greater levels of Type A behaviour are observed" (p. 371). Indeed the highest concentrations occurred between all scales of the JAS, and "employer expectations". This is not surprising considering the issue of control, discussed earlier. Variables related to the need for status are personal and if not fulfilled can perhaps be managed by such means as were proposed by Festinger (1957). That is, the individual may reduce dissonance by convincing himself, for example, that "time with the family is worth more than another promotion". On the other hand employer expectations are not amenable to personal control and therefore pose the greatest threat. Mettlin concluded that the TABP is so embedded in the modern

occupational career that intervention might even meet with resistance from the subject population. The issue of intervention and employer responsibility will be discussed in a later section.

Howard et al., (1977) in their study involving managers from twelve different companies (discussed earlier) reported that in general A1 subjects as measured by the SI put in the longest work week, worked more discretionary hours and travelled out of home base more days per year. Further on an Index of Job Satisfaction (Smith et al., 1969), there was a tendency for A1s to be less satisfied with their jobs. Using a scale designed to solicit information on a number of elements of their job, factor analysis yielded five factors labelled Ambiguity, Locked In, Stagnation, Isolation and Contentment. Of interest is the fact that Type As do not feel locked in relative to Type Bs, or at least deny such feelings, which tends to add evidence that As may be internal with respect to Rotters' Locus of Control Approach. Extending this hypothesis, those internals who actually become or admit to being locked in, hence losing the perception of control, may be the ones at risk of CHD.

Matthews & Saal (1978) performed a study to identify relationships between the TABP and various motivational constructs: the need for achievement, the need for power (included because of its similarity to Glass' (1977) coping style aimed at maintaining and asserting control over the environment), and job involvement. The SI, JAS (Form B) and the Mandler Test Anxiety Questionnaire were used. It was reported that the TABP (measured by both the JAS and SI) was not

significantly related to achievement or power, however when the need to achieve and the need to avoid failure were considered simultaneously, a different pattern emerged. JAS Type As were individuals high on the need to achieve and low on the need to avoid failure. "Men with this particular combination of dispositions choose moderately challenging tasks, [and] persist longer on them" (p. 635).

Also related to the need for a achievement was a study by Matthews, Helmreich, Beane & Lucker (1980). Type A members of the Society of Experimental Social Psychologists completed the JAS - (Form B) and an achievement measure - The Work and Family Orientation Questionnaire. (Helmreich & Spence, 1978). In addition the number of times members were mentioned in the Social Science Citation Index, 1974 to 1976, (including self-citations) was obtained. It was reported that pattern A is substantially and positively associated with Mastery, Work and Competitive scores demonstrating the need for achievement in such individuals. Especially pertinent are the correlations between Mastery and A/B scores, Factor H scores and Factor S scores: 0.45, 0.46 and 0.35 respectively ( $p < .01$ ). Matthews et al. pointed out the empirical support that such results offer for the importance of controllability in Type A individuals and stated "it would be worthwhile to examine the interrelationship of Pattern A, motivation to master, and cardiovascular processes in other samples" (p. 965) - one of the goals of the present study. Matthews et al. also reported that consistent with the hard-driving competitiveness component of the TABP, Type As tended to be cited more often by others



and to be productive during the mentioned years.

As argued by Matthews et al. "cardiovascular processes" should be examined. Several studies have attempted this, and are reviewed below.

Van Dijkhuizen & Reiche (1980) utilized Caplan's (1971) model to examine the effect of stress on middle management. Stress was defined as a characteristic of the job environment that poses a threat to the individual, and strain as any deviation from average response in a person, for example, in job dissatisfaction, blood pressure or cholesterol level. Items such as personality and the TABP mediate this link. The sample consisted of workers, foremen, middle managers, supervisors of middle managers, personnel specialists and technical specialists of medium and large sized Dutch industries. Subjects completed the Sales (1969) nine item index of the TABP, and an organization stress inventory. Cholesterol level, blood pressure and heart rate were recorded. With respect to middle managers it was reported that stress involved three factors: (1) work load, (2) poor relations with others, and (3) ambiguity. The latter factor involved not knowing exactly what job responsibilities were and hence, as argued earlier, bears some relationship to controllability. "Work load" appeared to be correlated with greater job satisfaction, higher self-esteem, a lower incidence of absenteeism, higher blood pressure, a higher incidence of smoking and obesity. "Poor relations with others" was strongly connected with job-related threat, and somewhat related to less absenteeism and lower blood pressure. Finally, "ambiguity"

had the most negative relation with stress, correlating with higher cholesterol level, higher blood pressure and absenteeism. Pertaining to employer responsibility "there is a very clear relation between the perception of the work situation and mental and physical well-being" (p. 126-127). Examining the mediating influence of the TABP it was reported that the Type A middle manager either works in situations or simply finds those situations that in his own perception demand more. A more powerful test of this conjecture would have been possible had the JAS been used including its sub-scales. In particular the dimensions "job involvement" and "hard driving and competitive" may have shed further light on the issue. For further analysis the authors obtained correlations between the stresses and strains for extreme As and Bs, and reported differences on the first factor "poor relations with others", regarding psychosomatic complaints and psychic complaints, blood pressure and cholesterol level. For the third factor "ambiguity", there occurred A/B differences in systolic blood pressure. Overall it was concluded that the TABP had an influence on the relationship between psychosocial stress and strains. Relative to company size it appeared as if medium sized organizations (500 to 2,000 employees) were more prone to high stress.

Glass, Krakoff, Contrada, Hilton, Kehoe, Mannucci, Collins, Snow & Elting (1980) performed two experiments which examined the relationship between the TABP and cardiovascular and plasma catecholamine responses to experimental competition and harassment. Subjects

took part in a game in the presence of either a silent opponent or a hostile opponent who uttered comments such as "can't you keep your eye on the ball". In the first experiment there was no difference during the hostility conditions for Type B individuals. Type As, however, responded to hostility with significant increases in systolic blood pressure, heart rate and plasma epinephrine during competition. Although not directly related, this research has implications for the work environment. That is, whenever conditions are competitive (and presumably this is the case in a promotion oriented company), and mildly hostile, coronary correlated physiological responses occur.

A study which reported somewhat equivocal results was performed by Chesney, Sevelius, Black, Ward, Swan & Rosenman (1981). Subjects were 384 salaried, white collar male aerospace worker who completed the Work Environment Scale (Insel & Moos, 1974) and received the SI. Physiological measures included systolic and diastolic blood pressure, heart rate, serum total cholesterol, high density lipoprotein cholesterol, low density lipoprotein cholesterol and tryglycerides. No significant associations were found between any work environment variables and CHD risk factors except that physical comfort was related to systolic blood pressure. Likewise there was no direct relationship between Type A behaviour and the CHD risk factors. However, there were some significant interactions. For Type As, those settings "perceived as encouraging workers to make their own decision, take initiative, and carry more responsibility were associated with

lower blood pressures"...and, extremely pertinent to this study "laboratory research also parallels this result with studies demonstrating that Type A subjects experience blood pressure increases when confronted with situations that they cannot control, i.e., situations where the relationship between action and reinforcement is outside their control" (p. 554). Such comments emphasize the need to examine further the TABP/controllability interaction.

#### SUMMARY

A brief history of CHD and its impact on the industrialized world was offered as a rationale for continued research into this phenomena. Part of this research has for approximately 25 years involved the TABP which identifies individuals according to their likelihood of developing CHD, with Type A individuals being approximately twice as likely to develop CHD compared to Type B individuals. Nevertheless, it was argued that this ratio is not strong enough to legitimately consider the TABP as being representative of coronary prone behaviour since the majority of those categorized as Type A do not develop CHD. This criticism was found to apply to all measurement techniques of the TABP, specifically the SI and the JAS Form B. It was postulated that the Type A category requires further examination in order to identify a sub-group containing those who will eventually develop CHD.

One area of research which has peripherally been associated with the TABP involves controllability. The factors identified from the SI - intensity of ambition, competitiveness, feelings of hostility

and a sense of time urgency, and from the JAS Form B - job involvement, hard driving and competitiveness, and speed and impatience, do not include controllability but this is not surprising for the JAS was not designed to pick out such a factor - only five items out of 52 even broach this topic - and the JAS itself was intended to emulate the SI. It is somewhat surprising that questions related to this concept were not included considering the effort that Jenkins (1977) expended and the conclusions reached in related research.

To examine the effect of stress relative to the elicitation of Type A behaviours, Lazarus' (1966) model was examined, and it was concluded that personality and environmental factors combine to yield the individual's perceived degree of control over any specific threat. Apparent was the emergence of cognitive strategies used to assess and cope with the threat. These related to certain personality dimensions: Locus of Control (external vs internal), and Field Dependence/Independence. A review of the literature concerning these dimensions suggested that internal, Field Independent individuals who are forced into an external Field Dependent mold may be more susceptible to CHD; therefore, the Type A/B dimension should be compared under stressful conditions. It was pointed out with reference to trait anxiety that the tendency for Type A subjects to deny subjective states which interfere with performance may act against self-reported measures of trait anxiety, thus explaining the reported non-significant results.

It was argued that controllability should be examined within

the work place - a known stressful environment. Again evidence was cited for the importance of controllability to the general well-being of employees; for example, major stressors cited included role conflict, job ambiguity and the fear of failure.

Associated with the TABP and CHD are certain physiological reactions but it was argued that these reactions are mediated by the cognitive styles of differing personalities. Pertinent to this study, data concerning catecholamines, serum cholesterol, tryglycerides and blood pressure were examined. It was seen that catecholamines primarily affect the sympathetic component of the autonomic nervous system; however, evidence was presented which suggested that catecholamines also predispose the arteries to infiltration by lipids, and affect blood clotting and facilitate thrombosis. Major reviews have examined these measures in detail under a variety of stressors and it is generally accepted that CHD is associated with elevated systolic blood pressure, and higher concentration of serum cholesterol and tryglycerides.

Again it was argued that the assumptions linking the TABP and the described physiological measures are too gross. Individual differences within the Type A population may result in different physiological response to stress, some of which may not result in CHD. It was hypothesized, then, that cognitive strategies related to controllability may interact with the TABP to create coronary proness. Literature, not reviewed here, (see Matthews, 1982; Malcolm, 1980) has

linked the TABP with sympathetic arousability or excitability. Therefore, it may be a predisposition for arousal coupled with an internal cognitive style and a particularly stressful situation that represents a dangerous combination.

As stated, an area peculiar to high stress is the work place, and the literature generally agreed that this is especially so for executive levels of middle management rank. Therefore it was argued that examining such a population would be valuable for two reasons: (1) because developed TABPs are likely to be found, and (2) because pertinent findings may point to means of reducing stress and hence contribute to the lowering the incidence of CHD in this stressful environment. In general studies performed within this population add evidence that controllability and the cognitive styles related to it are associated to the TABP.

#### STATEMENT OF PURPOSE

The purpose of the proposed study is to examine the TABP with the intent of identifying a sub-group of individuals which is at the greatest risk of developing CHD on the basis of both the standard risk factors and Type A behaviour. The reviewed literature suggests that such a group may differ from other individuals on the basis of controllability.

In order to examine this issue, a sample of officers, members of the Canadian Armed Forces, completed a variety of inventories: the JAS Form B (Jenkins et al., 1967) the Job Involvement Scale

(Lodahl & Kejner, 1963), the Multidimensional Locus of Control Scales (Levenson, 1975); the Multidimensional Health Locus of Control Scales (Wallston and Wallston, 1978); The Minnesota Satisfaction Questionnaire (Weiss, Dawis, England & Lofquist, 1967), The Work and Family Orientation Questionnaire (WOFO II) - (Helmreich & Spence, 1978), The Group embedded Figure Test (Witkin, et al., 1979); and the Social Support Questionnaire (Sarason, Levine, Basham & Sarason, 1983.) All of these measures (described in greater detail later) except the JAS have some bearing on the issue of controllability, either with regard to responses to uncontrollable situations or to cognitive states which utilize various degrees of control. It is expected that in this relatively high risk sample - the military equivalent to middle/senior management - a factor analysis of the pooled measures will yield a factor comprised of those subscales directly related to controllability (for example, the mastery and competition subscales of the WOFO II). It is further expected that a canonical correlation between JAS (AB) scores and physiological risk (PR), as calculated from the Coronary Risk Handbook (American Heart Association, 1973) on the one hand and factors scores based on the factor analysis on the other, will associate high AB scores and high PR with controllability, indicating that those with a high need for control and who work in a stressful environment are at the greatest risk of developing CHD.

Figure 1 depicts the model under examination. It indicates that the traditional risk factors are relatively independent of the TABP but that both are associated with CHD. Further it indicates the



contention that Controllability is related to both the traditional factors and the TABP and is thus implicated in the onset of CHD.

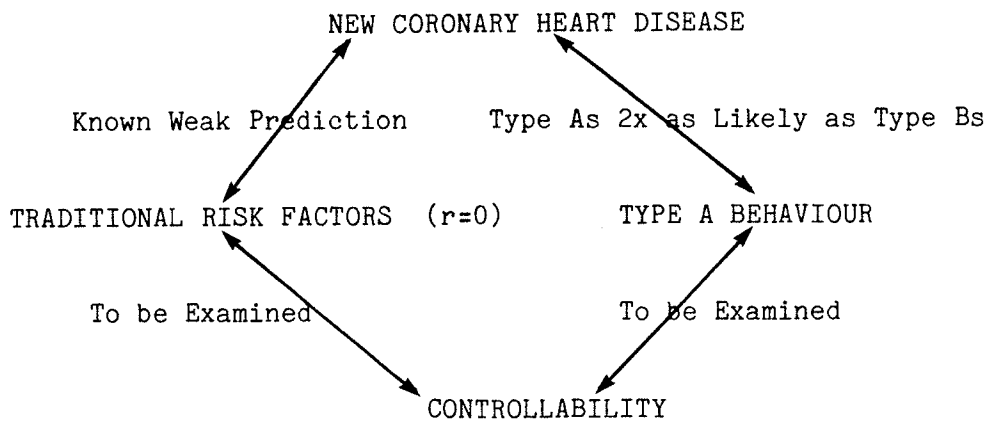


Figure 1 Schematic of Predicated and Expected Factors Related to CHD

Finally the ultimate goal of the study is to suggest means of alleviating stress within executive populations. Howard et al. (1977) stated with reference to the TABP that the job conditions most influential in eliciting that pattern are "supervisory responsibility, competitiveness, heavy workloads, and conflicting demands" (p. 834). DeHart (1980) with reference to the United States Air Force stated:

A description of the Type A Personality would include most of the following characteristics: excessive drive, time urgency, easily provoked impatience, over-commitment to job or profession, intense competitiveness, strong sense of duty, abruptness of speech and gestures, achievement oriented, and long work hours. In the Air Force it is a behavior that is admired respected, often encouraged, and frequently rewarded (p. 1058).

Indeed, the same is true for the Canadian Forces; rank, the outward symbol of competitiveness and success is worn for all to see, without doubt contributing to the stress of individuals, especially Type A who have not advanced as rapidly as their peers. Therefore, it is contended that the degree to which employees, military or not, can legitimately strive in order to create productivity and profit requires examination considering the health risks involved. This study will conclude with an examination of these issues.

#### STATEMENT OF HYPOTHESES

The proposed study involves the examination of a variety of psychometric scales related to cognitive styles and behavioural syndromes. It is hypothesized that controllability will emerge as a factor from the pooled measures, and via a positive association with the TABP and Physiological Risk it will be associated to be onset of CHD.

METHODSUBJECTS

Approximately 120 male officers of Captain to Colonel rank (age 30 to 54 years), members of the Canadian Forces Air Command, were requested to take part this study. Appendix A contains the letter sent to these individuals, all of whom were employed in staff positions. Such positions are filled by officers of both aircrew and ground crew categories, normally selected on the basis of expertise in certain areas.

The reason for utilizing this group as subjects is as follows: they represent the executive of the Air Force and are subject to the typical stresses of such positions. The majority of such officers indicated a preference for their normal occupations which involves flying, engineering and related fields. Nevertheless staff duties are integral to the promotion system of the Canadian Forces. Staff officers, then, are often obtained from positions of command in the field which have a high degree of autonomy, and are placed in an environment where typically the type of work is dictated by a superior and where the pace of work, also dictated by that superior, is usually hectic. In other words there is a marked decrease in the individual's personal sense of autonomy and control. Further, frustration is added because the individual rarely sees the results of his labour. For example, by the time a particular project, say the purchase of equipment, has been completed the particular staff officer who initiated the process, in

all probability, has been posted to a different position. In summary, the stress level is high due to the forced pace dictated by others, the perceived lack of purpose caused by time lags between initiation and completion of projects and, as happens on occasion, changes in policy, political and otherwise, which result in project cancelations after the expenditure of a great deal of individual effort.

In total, 66 officers took part in the present study. Two sets of data were discarded due to incompleteness.

#### MEASURES

Subjects completed the seven measures contained in Appendices B to H plus the Group Embedded Figures Test from which the 20 variables being considered were derived. The measures are described below:

##### The Jenkins Activity Survey for Health Prediction (JAS) - Form B

As described previously, the JAS yields an overall A-B score and three factor scores - Factor H (Hard-Driving Competitiveness), Factor S (Speed and Impatience), and Factor J (Job Involvement). The JAS has a mean standardized score of zero and a standard deviation of 10. The factor scores are obtained from the unit weighting of appropriate items. Reliability (test-retest correlations) of the A-B dimension range between .60 and .70 across intervals of 1 to 4 years in middle-aged men (Jenkins, 1978).

##### The Job Involvement Scale (JIS)

The JIS is a 20-item questionnaire designed to measure the degree to which a person identifies psychologically with his work, or

the importance of work in his total self-image. Reliability for the scale is reported to be .72, .82 and .89 (corrected split half correlation coefficients) for nurses, engineers and students respectively (Lodahl and Kejner, 1965).

#### The Multidimensional Locus of Control Scales (MLC)

The MLC scales used in this research were derived from Rotter's (1966) social learning theory and were developed by Levenson (1973, 1974, 1975) who argued that internal (I) beliefs are independent of external beliefs, and that understanding of these dimensions is improved by examining external control by powerful others (P) apart from fate and chance expectations (C). She therefore developed three 8-item Likert scales (I, P and C) to measure these dimensions and demonstrated discriminant validity. Further, internal consistency (alpha reliabilities) ranged from .51 (I scale) to .73 (C scale). The P and C scales were moderately correlated ( $r = .59$ ) but were essentially independent of the I scale.

#### The Multidimensional Health Locus of Control Scales (MHLC)

The MHLC scales were developed from the MLC scales described above. Wallston and Wallston (1978) similarly stated that sources of reinforcements for health-related behaviours are primarily internal, pertain to chance, or are controlled by powerful others. Alpha reliabilities ranged from .67 to .77 which compare favourably to Levenson's scales.

#### The Minnesota Satisfaction Questionnaire (MSQ)

Fourteen of the MSQ's (Weiss et al., 1967) 29 items relate to

two factors of interest to this study - intrinsic and extrinsic satisfaction pertaining to the workplace. Alpha coefficients are .73 and .81 respectively for these components (Ivancevitch and Matteson, 1982).

#### The Work and Family Orientation Questionnaire - II (WOFO-II)

The WOFO-II (Helmreich and Spence, 1978) contains 14 items scored to yield four scale scores: work, which measures positive attitudes towards the job; mastery, which measures the preference for challenging tasks; competitiveness, which describes a desire to win in interpersonal situations; and personal unconcern (alpha coefficients .39, .60, .54 and .55 respectively). The first three of these subscales, as described later, pertain to controllability.

#### The Group Embedded Figures Test (GEFT)

The GEFT (Witkin et al. 1971) is a commonly used measure of field dependence/independence. It consists of 18 items, with scores representing the total number of items in which the simple figure is correctly traced in the complex embedding design. The GEFT was developed from the Embedded Figures Test (EFT), the reliabilities of which are reported to range from .61 to .92. Correlations between the GEFT and EFT scores are .82 and .63 for male and female undergraduates respectively.

#### The Social Support Questionnaire (SSQ)

The SSQ yields measures of the perceived help or support available to individuals in their environment and the satisfaction with that support. The test-retest correlations for a 4-week interval

are .90 and .83, respectively, indicating high reliability.

Comparisons with other personality measures indicate high validity (Sarason, et al., 1983).

#### Other Measures

Subjects completed a questionnaire (Appendix I) which yielded information concerning rank, age, smoking and exercise habits, and family history of CHD. In addition the risk of coronary heart disease was estimated using the Coronary Risk Handbook. Risk estimates are based on the Framingham epidemiological study performed by the United States Public Health Service, and were prepared under the supervision of the American Heart Association Committee on Reduction of Risk of Heart Attack and Stroke. Probabilities are based on sex, age, cigarette smoking, systolic blood pressure, serum cholesterol level, glucose tolerance, and ECG profiles. In the present study only one subject had ECG abnormalities and no subjects were glucose intolerant. Diastolic blood pressure was also obtained.

The risk of developing CHD within six years, referred to henceforth as physiological risk (PR) was thus calculated. Also a physiological trend (TR) based on systolic blood pressure (SBP), diastolic blood pressure (DBP) which tended to be in the same direction as SBP and cholesterol level (CL) was obtained: a score of 1, indicated improvement; a score of 2 indicated no change; and a score of 3 indicated a worsening in these levels. Medical records for the previous five years were utilized. Table 1 summarizes the eight variables and 31 measures used.

1	Age	
2	Rank (RA)	Captain - 1; Major - 2; Lieutenant-Colonel - 3; Colonel - 4
3	Use of Tobacco (SM)	0 - non-smoker; 1 - smoker
4	Amount of Exercise Engaged In (EX)	1 - zero exercise; 2 - 0 to 2 hrs jogging; 3 - 2 to 4 hrs joggin; 4 - greater than 4 hrs jogging (all forms of exercise were converted to an equivalent amount of jogging in terms of calories expended)
5	History of CHD in Blood Relatives (HIS)	1 - present; 2 - not present
6	Group Embedded Figures Test (GEFT)	High scores reflected Field Independence (FI) Low scores reflected Field Dependence (FD)
7	Job Involvement Scale (JIS)	High scores reflected job involvement
	Minnesota Satisfaction Questionnaire (MSQ):	High scores reflected satisfaction
8	General Satisfaction (GSAT)	
9	Intrinsic Satisfaction (ISAT)	
10	Extrinsic Satisfaction (ESAT)	
	Work and Family Orientation Questionnaire (WFOO-II):	High scores reflected a greater degree of the variable of concern
11	Personal Unconcern (WP)	
12	Work Orientation (WW)	
13	Mastery (WM)	
14	Competitiveness (WC)	
	Social Support Questionnaire (SSQ):	High scores reflected greater number of support sources and satisfaction respectively
15	Perceived Support (PS)	
16	Satisfaction with Support (SS)	
	Multidimensional Locus of Control Scales (MLC):	High scores reflected a greater degree of the variable of concern
17	Internal (MLC-I)	
18	Powerful Other (MLC-P)	
19	Chance (MLC-C)	
	Multidimensional Health Locus of Control Scales (MHLC):	High scores reflected a greater degree of the variable of concern
20	Internal (MHLC-I)	
21	Powerful Other (MHLC-P)	
22	Chance (MHLC-C)	
23	Systolic Blood Pressure (SBP)	
24	Diastolic Blood Pressure (DBP)	
25	Cholesterol Level (CL)	
26	Physiological Risk (PR)	Determined from sex, age, SM, glucose intolerance, ECG abnormalities, SBP, DBP, CL
27	Trend (TR)	Determined from SBP, DBP, CL, glucose intolerance over the last five years
	Jenkins Activity Survey Form B:	
28	AB Score	
29	Job Involvement Factor (JAS-J)	
30	Hard Driving Factor (JAS-H)	
31	Speed and Impatience Factor (JAS-S)	

Table 1 Measures and Variables



## PROCEDURE

Potential subjects were informed concerning the purpose of this research during a military briefing held daily by the Commander of Air Command. The information, contained in Appendix A, was both read and provided in written form. Briefly, it described the importance of identifying stressors which may contribute to CHD and indicated the proposed means of gathering such data. It also emphasized that anonymity would be maintained with respect to both the battery of inventories and medical records. Finally, it asked for volunteers willing to take part in the study.

Potential subjects were advised to go to one of two similar conference rooms at particular times in order to complete the battery. Anonymity was maintained by ensuring that individual batteries were identified by a five-digit number selected by the subject. This number was identifiable with respect to the subject's name only by a member of the medical branch who later attached the described medical data to the battery (Appendix J).

## DATA ANALYSIS

The study, as stated, examined the relationship of the described variables to risk of CHD. To accomplish this examination various procedures were utilized. First, univariate statistics were obtained for (1) all data, and (2) for all data pertaining to those subjects (Type As and Bs respectively) who placed in the upper and lower quartiles of the JAS AB scale. Second, a Hotelling T-square

analysis was performed between Type As and Bs on all variables. This analysis also yielded individual t-tests. Third, a Pearson product moment correlation matrix was utilized using all subjects and all variables in order to examine individual associations, although interpretive caution should be observed due to the elevation of the Type I error rate inherent in such a procedure. Fourth, all variables excluding AB scores and PR were factor analyzed. Fifth, a canonical correlation was performed between AB scores and PR values on the one hand, and the factor scores for those factors having Eigen values greater than one on the other. This procedure was utilized to ensure a thorough investigation of the relationships between key variables, notwithstanding the following inherent statistical weaknesses: a low variable to subject ratio and some dependence across the canonical correlation. For example physiological risk, a variable on one side of the canonical correlation, was obtained from blood pressure, cholesterol level and age, variables contributing to the factor scores on the other side of the correlation. Yet to avoid such dependence would have resulted in the loss of information concerning the association between the latter and AB score. To assess the impact of these weakness the same procedures (factor analysis and canonical correlation) were repeated omitting the variables age, GSAT, ISAT, ESAT, SBR, DBP, CL, JAS-J, JAS-H and JAS-S. Thus the subject to variable ration was raised to greater than 3:1 and all known dependencies were removed. Sixth, the relative impact of the factors obtained on CHD was examined under the assumption that those subjects with high AB scores and high PR would be

most likely to develop CHD. This examination was accomplished by plotting the canonical variate scores for each subject to create two sets of data points, representing subjects according to both sides of the canonical correlation respectively. Thus those subjects who scored as Type As at high PR, Type As at low PR, Type Bs at high PR and Type Bs at low PR respectively were compared on the basis of the identified factors. Finally those subjects falling into the above categories were compared on the basis of the original measures.

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## RESULTS

### INTRODUCTION

This section will essentially follow the format of the previous one, presenting:

1. Univariate statistics for all data;
2. Univariate statistics for extreme Type As and Type B subjects;
3. The Hotelling's T-square analysis and significant individual t-tests;
4. Significant results from the Pearson product moment correlation matrix;
5. The factor analysis;
6. The canonical correlation of AB score and PR vs Factor scores for the retained factors;
7. The plots of canonical variate 1 vs canonical variate 2 for both sides of the canonical correlation; and
8. Supplemental results - a comparison of those subjects at the extremes of the plots from (7) - above, on the basis of the original variables.

### UNIVARIATE STATISTICS FOR ALL DATA

Means and standard deviations for all data are contained in Table 2. It should be noted that scores on the JAS were as expected:

Jenkins (1979) reported for his original data a mean score of 227 and a standard deviation of 78 whereas this research yielded a mean of 230.2 and a standard deviation of 67.5; further, 17 subjects or 26.5% fell in the upper quartile (Type As) and 12 subjects or 18.8% fell in the lower quartile (Type Bs).

#### COMPARISON OF TYPE A AND TYPE B SUBJECTS

Table 2 also contains the means and standard deviation for the Type A and Type B subjects. Overall differences on the basis of these means were assessed using a Hotelling T-square analysis. This did not reach significance, nevertheless certain individual measures were significant. These results are presented below with the previously noted caution concerning the Type I error rate.

##### Job Involvement

The difference between Types A and B for Job Involvement (JIS) as measured by the scale of Lodahl and Kejner (1974) was highly significant ( $t(27) = 3.49, p < .002$ ) with Type As ( $\bar{X} = 57.71$ ) being more job involved than Type Bs ( $\bar{X} = 51.00$ ). Job involvement as measured by the JAS J-scale, however, did not reach significant ( $t(27) = 1.37, p < .183$ ) although again Type As ( $\bar{X} = 245.12$ ) were more job involved than Type Bs ( $\bar{X} = 224.42$ ). The attitude towards work as measured by the WOFO II yielded a marginally significant difference between Type As and Bs ( $t(27) = 1.90, p < .069$ ) with Type As ( $\bar{X} = 8.24$ ) regarding work as more important to them than Type Bs ( $\bar{X} = 7.08$ ).

	<u>ALL SUBJECTS</u>		<u>TYPE A SUBJECTS</u>		<u>TYPE B SUBJECTS</u>	
	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>
Age	42.54	6.63	42.53	5.96	45.42	7.87
RA	1.97	0.96	2.12	1.11	2.17	1.19
SM	0.25	0.44	0.29	0.47	0.25	0.45
EX	2.36	0.95	2.59	0.87	2.08	0.79
HIS	1.53	0.50	1.47	0.51	1.42	0.51
GEFT	14.11	4.12	15.29	3.16	13.42	5.30
JIS	51.78	7.22	7.77	5.17	51.00	4.97
MSQ						
GSAT	72.98	9.07	75.59	9.64	73.58	5.79
ISAT	45.00	5.61	47.06	5.56	44.33	3.77
ESAT	20.89	3.89	21.35	4.51	22.08	2.68
WOFO II						
WW	7.70	1.71	8.24	1.60	7.08	1.62
WM	7.16	2.37	8.59	1.50	6.75	2.37
WC	10.30	2.80	11.65	2.83	9.00	3.25
WP	5.39	1.64	5.24	1.75	6.00	1.60
SSQ						
PS	78.92	46.81	77.41	42.65	69.50	32.89
SS	137.81	14.39	130.88	10.74	140.58	12.67
MLC						
I	39.19	3.81	40.76	3.17	37.83	3.27
P	17.91	8.65	16.53	9.19	20.92	6.23
C	13.59	7.04	11.82	8.40	14.42	5.35
MHLC						
HI	29.92	3.84	28.47	3.43	25.67	2.84
HP	16.61	3.97	17.88	3.62	15.67	4.08
HC	15.53	4.26	14.35	5.13	15.75	4.69
SBP	121.52	14.48	122.47	13.24	119.58	8.17
DBP	78.30	11.05	80.47	10.24	77.00	8.46
CL	210.30	44.25	200.53	22.00	230.08	56.43
PR	2.66	2.01	2.56	1.70	3.57	1.75
TR	1.95	0.76	1.76	0.66	2.33	0.78
JAS						
AB	230.23	67.48	317.35	23.69	137.67	22.33
J	229.69	37.87	245.12	38.78	224.42	42.10
H	110.17	28.63	133.88	29.96	87.67	20.21
S	176.81	53.81	224.00	45.23	134.17	34.86

Table 2 Means and Standard Deviations for:  
 (a) All Subjects (b) Type A Subjects  
 (c) Type B Subjects

Mastery

Mastery, according to the WOFO II, yielded a significant difference between Type A and Type B subjects ( $t(27) = 2.55, p < .017$ ) with Type As ( $\bar{X} = 8.59$ ) requiring a greater degree of mastery in the work environment than Type Bs ( $\bar{X} = 6.75$ ).

Competition

Competition, according to the WOFO II, yielded a significant difference between Type A and Type B ( $t(27) = 2.34, p < .027$ ) with Type As ( $\bar{X} = 11.65$ ) being more competitive than Type Bs ( $\bar{X} = 9.00$ ).

Social Satisfaction Questionnaire

There was no significant difference between the amount of social support (PS) reported by Type As and Bs but there was a significant difference in the satisfaction (SS) gained from that support ( $t(27) = -2.22, p < .035$ ) with Type As ( $\bar{X} = 130.88$ ) being less satisfied than Type Bs ( $\bar{X} = 140.58$ ).

Multiple Locus of Control Scale

Of the three subscales of the MLC only differences pertaining to internal locus of control reached significance ( $t(27) = 2.42, p < .023$ ) with Type As ( $\bar{X} = 40.76$ ) being more internal than Type Bs ( $\bar{X} = 37.83$ ).

Multiple Health Locus of Control Scale

As with the MLH the only significant difference pertained to the internal dimension of this scale ( $t(27) = 2.32, p < .028$ ); again

Type As ( $X = 28.47$ ) were more internal than Type Bs ( $X = 25.67$ ).

#### JAS Scales

The Hard-driving (H) subscale yielded a highly significant difference between Type A and B subjects ( $t(27) = 4.64$ ,  $p < .0001$ ) with Type As ( $\bar{X} = 133.88$ ) being more hard-driving than Type Bs ( $\bar{X} = 87.67$ ). Similarly the subscale related to speed and impatience (S) yielded highly significant difference ( $t(27) = 5.77$ ,  $p < .000$ ) with Type As ( $\bar{X} = 224.00$ ) being more impatient than Type Bs ( $\bar{X} = 134.17$ ). The job involvement scale (J), as noted, failed to reach a significant result.

#### Physiological Measures

Of the three physiological measures, SBP, DBP and cholesterol level, only the latter yielded a marginally significant difference, ( $t(27) = -1.97$ ,  $p < .059$ ). Of interest, however, Type As ( $\bar{X} = 200.53$ ) had lower cholesterol levels than Type Bs ( $\bar{X} = 230.08$ ). The overall risk (PR) of CHD was not significantly different between Type As and Type Bs, in fact the greatest risk was reported for Type Bs ( $\bar{X} = 3.57$ ) in comparison to Type As ( $\bar{X} = 2.56$ ). When trend (TR) was examined, a significant difference was noted ( $t(27) = -2.12$ ,  $p < .044$ ) with Type As being less at risk than Type Bs.

#### CORRELATION MATRIX BETWEEN ALL VARIABLES

Table 1 of Appendix K contains the complete Pearson Product Moment Correlation matrix and associated probabilities. As noted earlier, caution should be exercised in interpreting these results due



to the expanded Type I error rate associated with the large number of correlations. This section will describe each variable in turn in terms of significant and/or pertinent association with the others. Only the results which were in general agreement with those of a Spearman correlation matrix (utilizing the original data) are included. Correlations and probabilities are presented in the following tables.

### Age

Subjects ranged in age from 30 to 54 years.

	<u>PR*</u>	<u>RA*</u>	<u>WP</u>	<u>JIS</u>	<u>WM</u>
<u>AGE</u>	.734	.440	.322	.274	-.258
	.0001	.0003	.009	.029	.040

\*To be expected since CHD and rank are known to increase with age

Table 3 Pearson Correlations with Age

### Rank

Rank was classified as follows: Captain - 1; Major - 2; Lieutenant-Colonel - 3; Colonel - 4.

	<u>AGE</u>	<u>JAS-J</u>	<u>GSAT</u>	<u>ISAT</u>	<u>SS</u>	<u>WM</u>	<u>ESAT</u>
<u>RA</u>	.440	.285	.285	.257	.247	-.243	.242
	.0003	.022	.023	.041	.049	.053	.054

Table 4 Pearson Correlation with Rank

### Smoking

Subjects were divided into two groups, smokers and non-smokers, classified as one and two, respectively. There were no significant correlations with smoking, however the highest correlation was with exercise ( $r = -.335$ ,  $p < .007$ ).

Exercise

Subjects were ranked according to the amount of exercise engaged in per week as follows: no exercise - 1; 0 to 2 hours - 2; 2 to 4 hours - 3; 4+ hours - 4. All forms of exercise was converted to time spent jogging, on a calorie expended basis.

	<u>ISAT</u>	<u>SM</u>	<u>WW</u>	<u>MLC-C</u>
<u>EX</u>	.253	-.335	.322	-.249
	.043	.007	.010	.047

Table 5 Pearson Correlations with Exercise

History of CHD

Subjects were divided into two groups according to whether they reported CHD in blood relatives as distant as grandparents. Those with a history were categorized as 1, and those without a history as 2. The only significant result was with the powerful other dimension of the MLC ( $r = -.291$ ,  $p < .019$ ). That is, externals tended to report a family history of CHD.

Field Dependence/Independence

Field dependence as measured by the GEFT results in low scores and field independence in high scores.

	<u>MLC-C</u>	<u>WM</u>
<u>GEFT</u>	.255	.243
	.042	.053

Table 6 Pearson Correlations with the GEFT

Job Involvement

Of note were the significant correlations between the JIS and

the JAS scales.

	<u>JAS-J</u>	<u>JAS-AB</u>	<u>JAS-H</u>	<u>JAS-S</u>	<u>ISAT</u>
<u>JIS</u>	.422 .0005	.418 .0006	.399 .001	.394 .001	.370 .003
	<u>WC</u>	<u>AGE</u>	<u>GSAT</u>	<u>SS</u>	
<u>JIS</u>	.303 .015	.273 .029	.258 .040	-.333 .007	

Table 7 Pearson Correlations with Job Involvement

Job Satisfaction

The measures of job satisfaction (GSAT, ISAT and ESAT) are tabulated together since it was evident that they were highly associated. Descending order is based on GSAT.

	<u>GSAT</u>	<u>ISAT</u>	<u>ESAT</u>	<u>JAS-J</u>	<u>RA</u>	<u>JIS</u>
<u>GSAT</u>	1.000 .000	.915 .0001	.868 .0001	.364 .003	.285 .023	.258 .040
<u>ISAT</u>	.915 .0001	1.000 .000	.622 .0001	.380 .002	.257 .041	.370 .003
<u>ESAT</u>	.868 .0001	.622 .0001	1.000 .000	.288 .021	.242 .054	--- ---
	<u>EX</u>	<u>JASH-H</u>				
<u>ISAT</u>	.253 .043	.248 .049				

Table 8 Pearson Correlations with Job Satisfaction

Work and Family Orientation

The measures of the WOFO-II (WP, WW, WM and WC) are tabulated

together since they were associated.

	<u>WP</u>	<u>WW</u>	<u>WM</u>	<u>WC</u>	<u>AGE</u>	<u>JAS-AB</u>	<u>JAS-S</u>	
<u>WP</u>	1.000 .0000	---	---	---	.322 .009	---	-.276 .027	
<u>WW</u>	---	1.000 .0000	.527 .0001	.241 .055	---	---	---	
<u>WM</u>	---	.527 .0001	1.000 .0000	.460 .0001	-.258 .040	.268 .032	---	
<u>WC</u>	---	.241 .055	.460 .0001	1.000 .0000	---	.380 .002	---	
	<u>JAS-H</u>	<u>SS</u>	<u>EX</u>	<u>MHLC-P</u>	<u>DBP</u>	<u>SBP</u>	<u>RA</u>	<u>JIS</u>
<u>WW</u>	.438 .0003	---	.322 .009	.301 .015	---	---	---	---
<u>WM</u>	.397 .001	---	---	---	.248 .048	.269 .031	-.243 .053	---
<u>WC</u>	.548 .0001	-.403 .001	---	.309 .013	---	---	---	.303 .015

Table 9 Pearson Correlations with Work and Family Orientation

Social Support Variables

There was no observed association between perceived amount of support (PS) and satisfaction with that support (SS). Results of correlations between these and other variables are presented below.

	<u>MLC-I</u>	<u>MHLC-P</u>	<u>RA</u>	<u>JIS</u>	<u>WC</u>	<u>MLC-P</u>
<u>PS</u>	.271 .030	.281 .025	---	---	---	---
<u>SS</u>	---	---	.247 .049	-.333 .007	-.403 .001	-.277 .026
	<u>SBP</u>	<u>JAS-AB</u>	<u>JAS-H</u>	<u>JAS-S</u>		
<u>SS</u>	-.234 .063	-.243 .054	-.249 .047	-.243 .053		

Table 10 Pearson Correlations with Social Support Variables

Locus of Control

Results of the correlations between the MLC, MHLC and all other variables are presented below grouped according to the internal, external-powerful other and external-chance dimensions.

	<u>MHLC-I</u>	<u>MHLC-C</u>	<u>AGE</u>	<u>PS</u>					
<u>MLC-I</u>	.379	---	---	.271					
	.002	---	---	.030					
<u>MHLC-I</u>	1.000	-.382	.243	---					
	.0000	.002	.053	---					
	<u>CL</u>	<u>MLC-C</u>	<u>MHLC-C</u>	<u>HIS</u>	<u>WW</u>	<u>JAS-S</u>	<u>WC</u>	<u>PS</u>	<u>SS</u>
<u>MLC-P</u>	.277	.354	.297	-.291	---	---	---	---	-.277
	.027	.004	.017	.020	---	---	---	---	.026
<u>MHLC-P</u>	---	---	.319	---	.301	.335	.309	.281	---
	---	---	.010	---	.016	.007	.013	.025	---
	<u>MLC-P</u>	<u>MHLC-C</u>	<u>GEFT</u>	<u>MHLC-I</u>	<u>MHLC-P</u>	<u>CL</u>	<u>EX</u>		
<u>MLC-C</u>	.354	.330	.255	---	---	---	-.249		
	.004	.008	.042	---	---	---	.048		
<u>MHLC-C</u>	.297	1.000	---	-.383	.319	.292	---		
	.017	.0000	---	.002	.010	.019	---		

Table 11 Pearson Correlations with Locus of Control Dimensions

Physiological Measures and Related Variables

Results of correlations between SBP, DBP, CL, PR, TR and all other variables are grouped and presented below:

	<u>SBP</u>	<u>DBP</u>	<u>CL</u>	<u>PR</u>	<u>TR</u>	<u>WM</u>	<u>MLC-P</u>	<u>AGE</u>	<u>MHLC-C</u>
<u>SBP</u>	1.000	.677	---	.299	.327	.269	---	---	---
	.0000	.0001	---	.017	.008	.031	---	---	---
<u>DBP</u>	.677	1.000	.290	.279	---	.248	---	---	---
	.0001	.0000	.020	.026	---	.048	---	---	---
<u>CL</u>	---	.290	1.000	.516	---	---	.277	---	.292
	---	.020	.0000	.0001	---	---	.027	---	.019
<u>PR</u>	.299	.279	.516	1.000	---	---	---	.734	---
	.017	.026	.0001	.0000	---	---	---	.0001	---

Table 12 Pearson Correlations with Physiological Measures and Related Variables

Results of correlations between the JAS AB, J, H and S scales and all other variables are grouped and presented below:

	<u>JAS-AB</u>	<u>JAS-J</u>	<u>JAS-H</u>	<u>JAS-S</u>	<u>JIS</u>	<u>WW</u>	<u>WC</u>
<u>JAS-AB</u>	1.000 .0000	.305 .014	.622 .0001	.620 .0001	.418 .001	--- ---	.380 .002
<u>JAS-J</u>	.305 .014	1.000 .0000	.243 .053	--- ---	.422 .001	--- ---	---
<u>JAS-S</u>	.622 .0001	.243 .053	1.000 .0000	--- ---	.399 .001	.438 .0003	.548 .0001
<u>JAS-S</u>	.620 .0001	--- ---	--- ---	1.000 .0000	.094 .001	--- ---	---

	<u>WM</u>	<u>WP</u>	<u>SS</u>	<u>GSAT</u>	<u>ISAT</u>	<u>ESAT</u>	<u>RA</u>
<u>JAS-AB</u>	.268 .032	--- ---	-.242 .054	--- ---	--- ---	.288 .021	---
<u>JAS-J</u>	--- ---	--- ---	--- ---	.364 .003	.380 .002	.288 .021	.285 .022
<u>JAS-H</u>	.397 .001	--- ---	-.249 .047	--- ---	.248 .049	--- ---	---
<u>JAS-S</u>	--- ---	-.276 .027	-.243 .053	--- ---	--- ---	---	---

Table 13 Pearson Correlations with JAS Scales

FACTOR ANALYSIS

All variables except JAS-AB and PR were factor analyzed (AB and PR scores were omitted because, as stated earlier, they were used as canonical variables in later analysis). A principle components analysis was performed and those factors with an Eigen value of greater than one were retained. In total ten factors were retained which accounted for 71.6 percent of the variance. A varimax rotation

yielded the factor pattern contained in Table 2 of Appendix K. Table 14, below, depicts the sorted varimax rotated factor pattern. That is, the factor loading matrix has been rearranged so that the columns appear in decreasing order of variance explained by the factors and the columns have been rearranged so that for each successive factor, loadings greater than .500 appear first. In addition loadings less than .400 have been replaced by zero. The sorted rotated factor pattern on the reduced data (19 variables only) is contained and labelled in Table 3 of Appendix K. The data supports the general pattern obtained for all data. Eight factors were retained which accounted for 71.0% of the variance and the order was essentially the same as before with factors associated with the excluded variables being absent.

The factors were labelled as follows:

Factor I (Job Satisfaction)

Factor I loaded primarily on the scales of the MSQ (GSAT - .959; ESAT - .881; ISAT - .856) and on the J-Scale of the JAS (.503). It is therefore labelled "Job Satisfaction".

Factor II (Controllability)

Variables loading on Factor II related to mastery and competition within the workplace. These included JAS-H (.748), WM (.732), WW (.730) and WC (.701). A high score on this combination of variables was viewed as representing a drive to control. Individual items included, for example: "If I am not good at something I would rather keep struggling to master it than move on to something I may be

	<u>VAR #</u>	<u>FAC I</u>	<u>FAC II</u>	<u>FAC III</u>	<u>FAC IV</u>	<u>FAC V</u>	<u>FAC VI</u>	<u>FAC VII</u>	<u>FAC VIII</u>	<u>FAC IX</u>	<u>FAC X</u>
SAT	8	.959	—	—	—	—	—	—	—	—	—
SAT	10	.881	—	—	—	—	—	—	—	—	—
SAT	9	.856	—	—	—	—	—	—	—	—	—
AS-J	29	.503	—	—	—	—	—	—	—	—	—
AS-H	30	—	.748	—	—	—	—	—	—	—	—
M	13	—	.732	—	—	—	—	—	—	—	—
N	12	—	.730	—	—	—	—	—	—	—	—
C	14	—	.701	—	—	—	—	—	—	—	—
BP	23	—	—	.890	—	—	—	—	—	—	—
BP	24	—	—	.826	—	—	—	—	—	—	—
HLC-C	22	—	—	—	.799	—	—	—	—	—	—
HLC-I	20	—	—	—	-.644	—	—	—	—	—	—
L	25	—	—	—	.604	—	—	—	—	—	—
GE	1	—	—	—	—	.808	—	—	—	—	—
P	11	—	—	—	—	.585	—	—	—	—	—
A	2	—	—	—	—	.585	—	—	—	—	—
AS-S	31	—	—	—	—	—	.800	—	—	—	—
M	3	—	—	—	—	—	—	-.742	—	—	—
K	4	—	—	—	—	—	—	.705	—	—	—
S	16	—	—	—	—	—	—	.539	—	—	—
J	5	—	—	—	—	—	—	—	.790	—	—
LC-P	18	—	—	—	—	—	—	—	-.533	—	—
S	15	—	—	—	—	—	—	—	—	.894	—
EFT	6	—	—	—	—	—	—	—	—	—	.864
LC-C	19	—	—	—	—	—	—	—	—	—	.551
R	26	—	—	.494	—	—	-.400	—	-.433	—	—
IS	7	—	.405	—	—	.457	.456	—	—	—	—
HLC-P	21	—	—	—	.468	—	.458	—	—	—	—
LC-I	17	—	—	—	—	—	—	—	—	.434	—

Table 14 Sorted Rotated Factor Pattern

good at." (WOFO II Q. 6); "When a group I belong to plans an activity, I would rather organize it...." (WOFO II, Q. 8); "It is important to me to perform better than others on a task" (WOFO II, Q. 13); and "I feel that winning is very important in both work and games" (WOFO II, Q. 14). The factor therefore was labelled controllability.



### Factor III (Blood Pressure)

Variables which loaded highest on Factor III were SBP and DBP (.890 and .826 respectively). The factor was therefore labelled "Blood Pressure".

### Factor IV (Locus of Control)

Variables which loaded highest on Factor IV was the C and I dimensions of the MHLC (.799 and  $-.644$  respectively) and CL (.604). Other high loadings involved various external dimensions (positively) and internal ones (negatively). The factor was therefore labelled Locus of Control.

### Factor V (Job Experience)

Variables which loaded highest on Factor V were AGE (.808), WP (.585) and rank (.585). On the basis of AGE and RA it was labelled "Job Experience".

### Factor VI (Speed and Impatience)

Variables loading highest on Factor VI were JAS-S (.800); JIS (.456); and MHLC-P (.458). Because of the singularly high loading on the JAS-S scale the factor was labelled speed and impatience, however the influence of powerful others was viewed as motivating to some degree such a characteristic.

### Factor VII (Health Habits)

Variables loading highest on Factor VII were SM ( $-.742$ ), EX (.705) and SS (.539). It was therefore labelled "Health Habits".

Factor VIII (Inheritability-External)

Variables loading highest on Factor VIII were HIS, or more specifically no history of CHD, (.790), MLC-P (-.533) and TR (-.433). In that history may be viewed as an external influence and considering the loadings of P and C, Factor VIII was viewed as reflecting the external dimension. It is therefore labelled "Inheritability-External".

Factor IX (Social Support)

The highest loading on Factor IX was PS (.894). Other loadings were substantially less, therefore it was labelled as such.

Factor X (Field Independence/Dependence)

The highest loadings on Factor X were GEFT reflecting FI (.864) and MLC-C (.551). Since these two variables are difficult to relate, Factor X was labelled according to the highest loading.

Summary

Table 15 summarizes these results.

<u>Factor</u>	<u>Cumulative Proportion of Total Variance</u>
I Job Satisfaction	.127
II Controllability	.245
III Blood Pressure	.336
IV Locus of Control	.406
V Job Experience	.476
VI Speed and Impatience	.533
VII Health Habits	.588
VIII Inheritability-External	.635
IX Social Support	.679
X Field Independence/Dependence	.716

Table 15 Factor Labels

CANONICAL CORRELATION

A canonical correlation was performed between two sets of variables: (1) JAS-AB scores and PR scores; and (2) subject factor scores for the 10 factors whose Eigen values were greater than one. Two sets of standardized coefficients for the canonical variables (CNVRF and CNVRS) were obtained and are contained in Table 16 below. The canonical correlations between the appropriate sets are contained in Table 16.

Standardized Coefficients for Canonical Variables for AB and PR Scores (CNVRF). Mean = 0, Standard Deviation = 1.

	CNVRF (1)	CNVRF (2)
PR	.807	.597
JAS-AB Score	-.522	.859

Standardized Coefficients for Canonical Variables for Factor Scores (CNVRS). Mean = 0, Standard Deviation = 1.

Factor	CNVRS (1)	CNVRS (2)
I	-.109	.169
II	-.213	.521
III	.404	.289
IV	.265	-.278
V	.587	.482
VI	-.467	.500
VII	-.149	-.081
VIII	-.156	-.001
IX	-.166	-.083
X	-.247	-.122

Canonical Correlation between CNVRF (1) and CNVRS (1) = .807,  $p < .0000$ .  
 Canonical Correlation between CNVRF (2) and CNVRS (2) = .716,  $p < .0000$ .

Table 16 Canonical Correlations Between JAS AB/PR Scores, and Subject Factor Scores for First Ten Factors

Examination of Table 15 indicates that, pertaining to the first canonical correlation (between CNVRF (1) and CNVRS (1)), High Physiological Risk and Low JAS AB scores were associated primarily with high scores on Factors III and V, and low scores on Factor VI and in the case of the second canonical correlation (between CNVRF (2) and CNVRS (2)) high AB scores and high physiological risk scores were associated with high scores on Factor II, V and VI. Also it is apparent that the differences between the coefficients of CNVRF (1) and CNVRF (2) pertaining to the low and high coefficients for AB score, were associated to differences between CNVRS (1) and CNVRS (2) which lie predominantly in Factors II and VI, since the respective coefficients for these factors have opposite signs.

Appendix K, Table 4 contains the canonical correlation for the reduced data. It indicates that only the correlation between the second set of standardized coefficient; (ie. between CNVRF (2) and CNVRS (2)) reached significance (canonical correlation = .567,  $p \leq .023$ ). The implications of this result and that of the larger coefficient for "Controllability" will be discussed under the next heading.

#### Plots of Canonical Variate Scores

Canonical variate scores for each subject were plotted. Specifically those relating to CNVRF (1) were plotted against those relating to CNVRF (2) (Figure 2) and CNVRS (1) was plotted against CNVRS (2) (Figure 3). Thus subjects were categorized according to canonical variate scores associated with Type AB score and PR, and

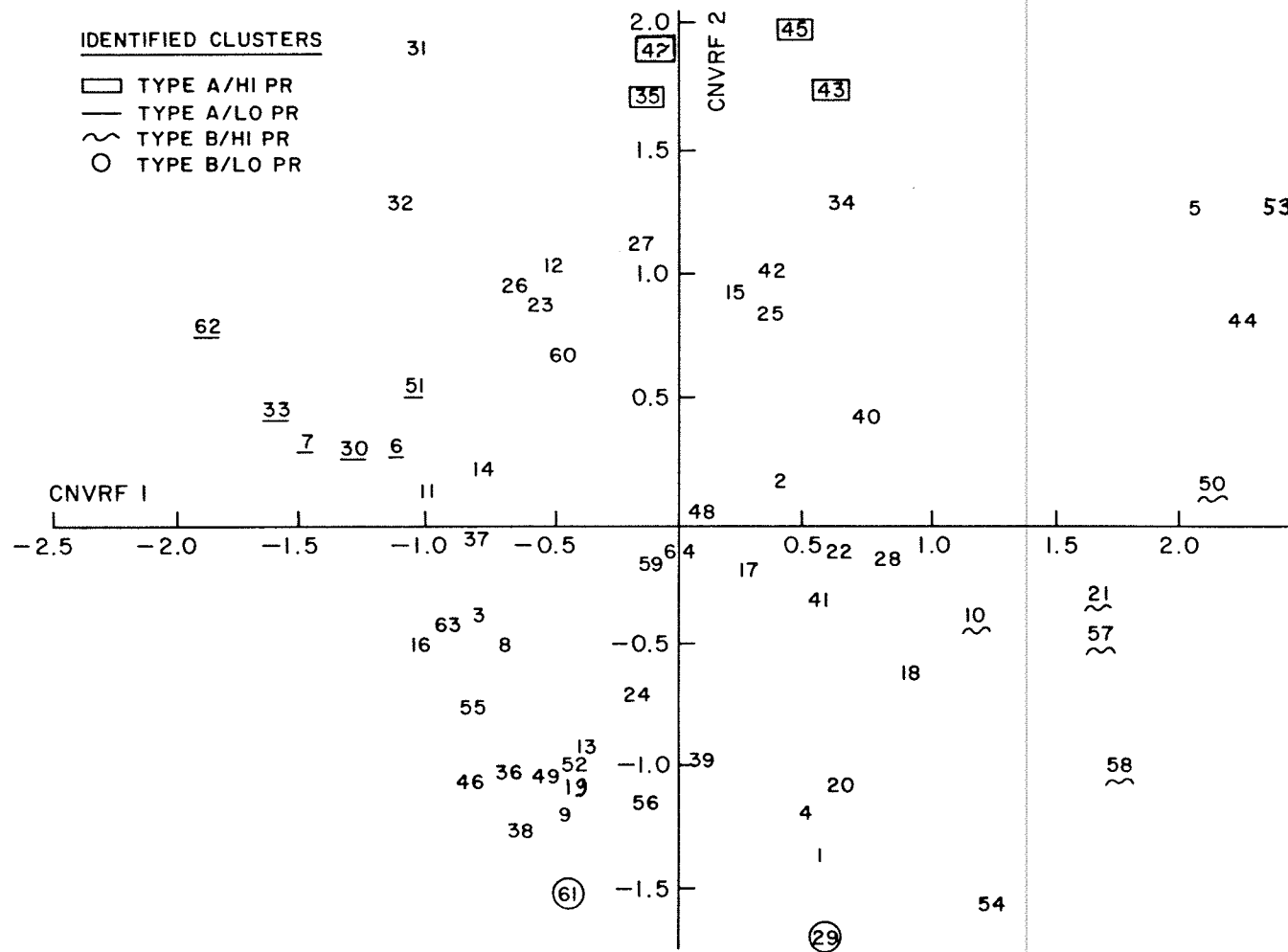


FIGURE 2. CANONICAL VARIATE SCORES FOR SET I-AB AND PR SCORES

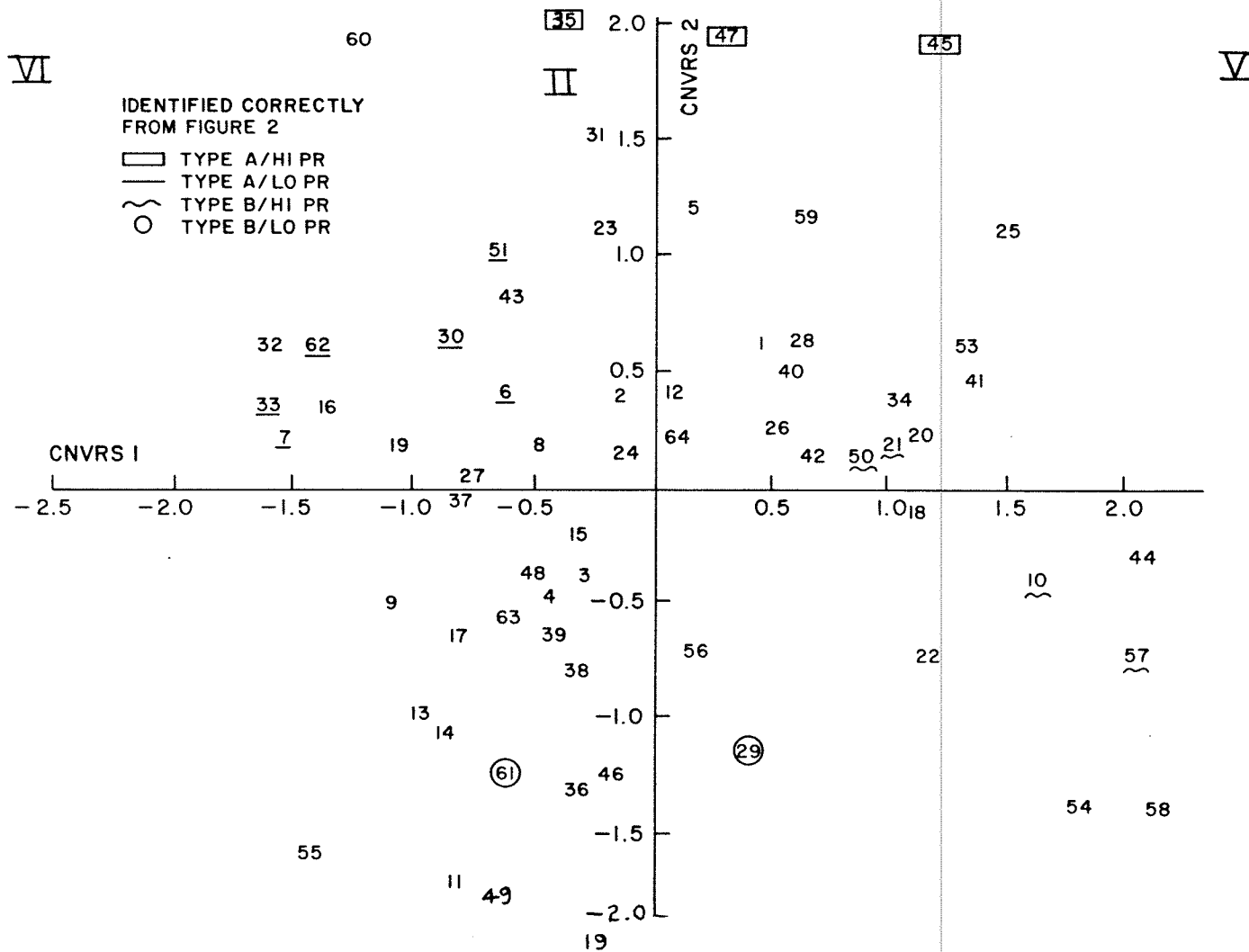


FIGURE 3. CANONICAL VARIATE SCORES FOR SET 2 - FACTORS SCORES

according to canonical variate scores associated with the factor scores. Relative to Figure 2, four subjects were categorized as being Type A at high PR, two subjects as Type B at low PR, six subjects as Type A at low PR, and five subjects as Type B at high PR. Thus 17 subjects of the 64 were at the extremes on these axes.

The implications of these results will be described in a later section, however it should be noted that three of the four subjects categorized as Type A/high PR (Figure 2) plotted at the high extreme of the ordinate of Figure 3, both of the subjects categorized as Type B/low PR (Figure 2) plotted towards low extreme of the ordinate of Figure 3, five of the five subjects categorized as Type B/high PR (Figure 2) scored towards high extreme of the abscissa of Figure 3 and six of the six subjects categorized as Type A/low PR (Figure 2) scored towards low extreme of the abscissa of Figure 3. In total then, canonical variate scores on the second set of variables correctly identified 16 out of 17 subjects on the first set. The 17th subject, categorized as Type A/high PR scored low on CNVRS (2), in the cluster of Type A/low PR subjects. Examination of individual factor scores indicated that he was atypical on variables related to both the physiological risk dimension and the AB dimension. When the same procedure was utilized for the reduced data only the vertical axes, with reference to Figures 2 and 3, remained significant. The lack of significance between CNVRF (1) and CNVRS (1) effectively collapsed the data points inwards to the vertical axes; thus, the discrimination between Type A/low PR and Type B/high PR was lost. Nevertheless this

statistically more rigorous procedure identified the same 3 of 4 Type A/high PR subjects on the basis of the retained eight factors, but primarily on the basis of the factor "controllability", as did the canonical correlation involving all variables.

The similarity between the above analytical methods and the high canonical correlation between these data plots (Figures 2 and 3) allows a description of the four categories (A/high PR; A/low PR; B/high PR; B/low PR) on the basis of the 10 retained factors. To assist in this description Table 17 contains the correlation matrix between all variables (AB score, PR score and the 10 factors for all subjects).

Examining the information of Figures 2 and 3 and that presented in Table 16, Type A/high PR subjects had a high need to control (Factor II), were job experienced (Factor V) and were impatient and needed to please powerful others (Factor VI); in comparison to Type B/low PR subjects who were opposite to this profile; further, Type B/high PR subjects had high blood pressure (Factor III) were also job experienced (Factor V) but were not impatient and did not regard pleasing powerful others as important (Factor VI) in comparison to Type A/low PR subjects who were opposite to this latter profile. Table 17 indicates the principle association of these factors to either the AB dimension or the PR scores. That is, Factor II was associated with the AB dimension ( $r = .438$ ) as was Factor VI ( $r = .514$ ) whereas Factors III and V were associated primarily with PR ( $r$ 's =  $.385$  and  $.585$  respectively).



	<u>PR</u>	<u>AB-Score</u>	<u>Fac I</u>	<u>Fac II</u>	<u>Fac III</u>	<u>Fac IV</u>	<u>Fac V</u>
PR	1.000						
AB-Score	-.091	1.000					
Fac I	-.023	.160	1.000				
Fac II	.037	.438	.003	1.000			
Fac IIV	.385	-.033	.003	.000	1.000		
Fac IV	.065	-.310	.018	-.102	-.002	1.000	
Fac V	.585	-.004	-.010	-.005	-.001	-.008	1.000
Fac VI	-.135	.514	.029	.012	-.013	.027	.004
Fac VII	-.117	.045	-.000	-.001	-.000	-.061	.033
Fac VIII	-.117	.071	-.009	-.001	.000	.029	-.013
Fac IX	-.143	.033	.010	-.018	.015	-.022	.002
Fac X	-.228	.033	.014	.000	-.000	.040	-.026

	<u>Fac VI</u>	<u>Fac VII</u>	<u>Fac VIII</u>	<u>Fac IX</u>	<u>Fac X</u>
Fac VI	1.000				
Fac VII	.008	1.000			
Fac VIII	.012	.000	1.000		
Fac IX	-.000	-.020	.017	1.000	
Fac X	-.014	-.000	-.000	.014	1.000

Table 17 Correlations Between Canonical Variables

Tables 16 and 17 point to other interesting trends which may shed light on certain confounding results noted in the introduction. For example, Factor IV which loaded moderately on both CNVRS (1) and CNVRS (2), .265 and -.278 respectively, was associated with AB score ( $r = -.310$ ), suggesting that CL, a component of that factor (.604), is negatively related to the TABP. On the other hand CL loaded on Factor III (.316) which was associated with PR. These findings suggest that a particular measure, CL in this case, may be positively associated with one risk factor pertaining to CHD and negatively with another. Thus the overall impact on CHD may tend to cancel and the results of research which has considered the TABP and CPB to be equivalent may be biased.

Finally, Factor IV which comprised primarily of internal and external type variables, was moderately correlated with the TABP ( $r = -.310$ ) indicating that Type A behaviour is associated with an internal locus of control and Type B to an external locus of control. The correlational matrix (Appendix K) which treated the locus of control scales separately did not indicate such a pattern.

The most significant result of this research is the emergence of Factor II - "Controllability" - as the only factor relating to the extremes of the AB and PR dimensions. That is, Type A high PR subjects have a high need for control in comparison to Type B low PR subjects. (Type B high PR and Type A low PR subjects were not so identified.) Further this factor had the highest loading on this dimension (.521) and therefore was deemed the most important. In addition Table 17 indicates it was the only factor which correlated positively with both AB score and PR, although the latter was not significant. Finally examination of Figures 2 and 3 in conjunction with Table 17, and in particular subjects 33, 45 and 47 (Type A/high PR) and 29 and 61 (Type B/low PR), revealed the singular importance of Factor II in that it alone caused clustering around the vertical axis. That is, Factors V and VI which loaded on that axis also loaded on the ordinate. In fact, from Table 16 a high score on Factor V would tend to pull the data points to position 'V' on Figure 3, and high scores on Factor VI would tend to pull the data points to position 'VI'. Thus a high score on both would be required to collapse the data points inward to the CNVRS 2 axis. Factor II, however, which did not load

significantly on CNVRS 1, could alone cause a clustering around position 'II', the position equivalent to Type A/high PR on Figure 2. Thus, assuming that those subjects at the highest risk of CHD are Type As with high PR then controllability is, indeed, associated with CHD.

#### SUPPLEMENTARY RESULTS

To examine these subjects further, means of all other variables were calculated for the four groups identified in Figure 2. Table 18 below contains these results. Due to the excessive number of t-tests involved and the relatively small number of subjects in each group (3, 6, 5 and 2 respectively) these results were not subjected to significance tests but rather were used to suggest a tentative behavioural profile for each group. Further, because age contributed substantially to PR, a similar post-hoc examination was made of the mean scores of: Type As with a positive trend (that is those demonstrating an improvement in blood pressures and cholesterol level) categorized as A1, Type As with negative trend (A3), Type Bs with a positive trend (B1) and Type Bs with a negative trend (B3). Again significance tests were not performed, rather the comparisons were made to assist in the compilation of a behavioural sketch of typical groups members. Table 19 contains these results.

	MSQ										
	<u>Age</u>	<u>RA</u>	<u>SM</u>	<u>EX</u>	<u>HIS</u>	<u>GEFT</u>	<u>JIS</u>	<u>GSAT</u>	<u>ISAT</u>	<u>ESAT</u>	
1. Type A/Hi PR (n=3)	50.0	2.7	0.7	1.7	1.7	14.0	60.3	80.0	51.0	20.7	
2. Type A/Lo PR (n=6)	36.8	1.5	0.2	2.7	1.5	14.9	56.9	70.8	45.3	19.1	
3. Type B/Hi PR (n=5)	50.8	2.3	0.2	2.2	1.2	10.8	49.8	75.2	45.4	22.2	
4. Type B/Lo PR (n=2)	38.5	2.0	0.5	1.5	2.0	17.0	47.0	71.5	41.5	23.5	

	WOFO II				SSQ		MLC			MHLG		
	<u>WW</u>	<u>WM</u>	<u>WC</u>	<u>WP</u>	<u>PS</u>	<u>SS</u>	<u>I</u>	<u>P</u>	<u>C</u>	<u>HI</u>	<u>HP</u>	<u>HC</u>
1.	9.0	8.0	12.7	7.0	26.3	124.7	41.0	14.7	8.0	32.0	14.0	9.0
2.	8.2	8.8	13.8	4.7	71.8	128.3	40.0	19.1	17.2	28.7	17.3	14.7
3.	6.8	6.0	7.6	5.6	60.6	144.0	37.8	17.8	14.4	25.6	13.4	14.0
4.	6.5	7.0	8.5	4.5	58.0	133.0	36.5	19.5	17.0	27.0	17.5	15.5

	JAS							
	<u>SBP</u>	<u>DBP</u>	<u>CL</u>	<u>TR</u>	<u>AB</u>	<u>J</u>	<u>H</u>	<u>S</u>
1.	121.3	79.3	209.7	1.3	320.0	226.0	140.3	193.3
2.	118.0	75.3	191.8	2.0	312.0	237.2	135.2	230.3
3.	120.4	76.0	233.2	2.8	142.2	223.6	82.2	139.9
4.	119.5	69.0	173.0	2.5	136.5	227.5	88.5	136.0

Table 18 Summary of Mean Values for Extreme Subjects of Figure 2

	MSQ										
	<u>Age</u>	<u>RA</u>	<u>SM</u>	<u>EX</u>	<u>HIS</u>	<u>GEFT</u>	<u>JIS</u>	<u>GSAT</u>	<u>ISAT</u>	<u>ESAT</u>	
Type A1 (n=6)	46.8	2.2	0.7	2.8	1.5	15.2	57.3	77.7	49.2	21.0	
Type A2 (n=2)	37.5	2.5	0.0	2.5	1.5	17.5	61.0	70.5	43.0	21.0	
Type B1 (n=2)	38.0	1.5	0.0	1.5	2.0	12.2	52.0	76.5	46.0	16.0	
Type B2 (n=6)	41.2	2.2	2.0	2.2	1.3	14.5	48.0	70.8	42.8	19.3	

	WOFO II				SSQ		MLC			MHLG		
	<u>WW</u>	<u>WM</u>	<u>WC</u>	<u>WP</u>	<u>PS</u>	<u>SS</u>	<u>I</u>	<u>P</u>	<u>C</u>	<u>HI</u>	<u>HP</u>	<u>HC</u>
1.	8.0	7.7	10.8	5.0	66.2	135.3	42.5	150.0	7.3	29	15.8	13
2.	9.0	10.0	13.0	4.5	119.5	123.0	42.5	23.5	11.5	29.5	23.5	15
3.	7.5	8.0	11.5	7.0	101.0	130.0	37.5	23.0	17.0	23.5	18.0	18.5
4.	7.3	7.0	8.2	6.2	69.7	145.3	38.5	19.0	13.2	24.5	15.2	14.3

	JAS							
	<u>SBP</u>	<u>DBP</u>	<u>CL</u>	<u>TR</u>	<u>AB</u>	<u>J</u>	<u>H</u>	<u>S</u>
1.	122.6	84.0	212.8	3.9	313.7	226.5	140.3	193.3
2.	135.0	91.0	247.0	2.8	333.0	285.0	150.0	287.0
3.	120.0	88.0	293.5	2.3	113.0	198.5	96.5	91.0
4.	122.7	78.0	233.0	4.1	147.0	245.0	88.5	129.5

Table 19 Summary of Mean Values for Extreme Subjects According to Trend

Of particular interest was the comparatively low degree of social support reported by Type A subjects at high PR ( $\bar{X} = 26.3$  compared to  $\bar{X} = 65.4$  for the other groups combined), yet the reported satisfaction with social support was virtually identical across groups. This tendency was not apparent for all Type As (see Table 2).

#### COMMENT ON RESULTS

The results reported are extremely varied and pertain to several issues: locus of control, social support, field independence/dependence, controllability, etc. The most significant result, however, was that controllability, as hypothesized, emerged as a factor, and further that it was the most significant of all factors related to CHD. This result suggests that subjects requiring a high degree of control - Type As in a stressful environment - develop physiological indicators of CHD. It further suggests that: (1) the TABP is not independent of behaviours exhibited to maintain control, and (2) that controllability measures may more accurately identify subjects who develop pathology under stressful condition. Indeed an excessive need for control may be a better indicator of coronary risk in a stressful workplace than current TABP measures which do not typically address this issue.

## DISCUSSION

### INTRODUCTION

The purpose of this study was to examine the interrelationship between standard risk factors pertaining to CHD, the TABP and other variables, primarily controllability, with a view to increasing the capability of identifying those at risk of CHD, ideally prior to onset. It was hypothesized that a subgroup of Type A individuals would be identified (not necessarily related to extreme or moderate Type A scores) on the basis of "controllability", defined previously, which would be at greater risk of CHD. This section will discuss the results outlined above and relate them to other research.

### FACTOR ANALYSIS AND CANONICAL CORRELATION

In agreement with previous studies which have demonstrated the independence of the TABP and standard risk factors (Haynes et al., 1975; Chesney et al., 1981) the physiological variables loaded on different factors to those loaded on by JAS related variables. Further, as suggested by McCrainie et al. (1981), physiological risk was somewhat related to field dependence, and the TABP as first indicated by Glass (1977) was negatively associated to an external locus of control.

Table 14 indicates that high blood pressures (SBP and DBP) represented the most significant loadings on Factor III - physiological risk, in comparison to cholesterol level (CL). This is contrary to the direction predicted by the Framingham study according to the Coronary Risk Handbook. In the latter, risk of CHD is approximately

quadrupled across typical range of cholesterol levels for 45 year old men in comparison to tripling across a similar range of systolic blood pressures. One explanation for this discrepancy may be that military personnel in general are required to maintain reasonable standards of health and are therefore placed on appropriate diets if, for example, cholesterol levels rise significantly. Thus it is evident that active intervention significantly reduces the risk of pathology.

The complicated structure of items contributing to CHD is indicated, for example, in the negative loading of internality to Factor III. That is, an internal locus of control was found to be associated negatively with PR via this factor, but, as stated earlier, associated positively with the TABP. Further, with reference to Factor V, a positive relationship to PR was noted. Thus, with reference to CHD, an overall association needs to be estimated - discussed later. A fourth variable loading on Factor III was TR, and was of interest in that examination of Type A and Type B subjects only yielded trends camouflaged by the factor analysis and subsequent canonical correlations of all subjects. Generally Type As demonstrated significantly improving blood pressures and cholesterol levels in comparison to Type Bs over the five year period but the most improvement was noted for Type As at high physiological risk. It is suggested that as Type As age, the focus of the psychological urge to control may shift from the work place to more personal areas such as health. It is also suggested that this shift may explain the confusion in the literature pertaining to A1s and A2s as categorized by the structured

interview. Although A1s logically should be at greater risk of CHD, Rosenman et al. (1970) noted that this may not be the case. It is argued that the behaviour of the fully developed Type A may, as stated, eventually contribute to alleviating overall risk by means of the noted shift in emphasis toward controlling health.

Examining the factor "Job Experience", Age represented the predominant influence, however. Rank was a significant contributor and it is of interest to note the combination of Rank and job involvement in this respect. That is, both Rank and the JIS loaded, but the JAS subscales did not. Thus, job experience, including success, as indicated by promotion was not associated with the typical struggle of the Type A. Further, there was a relatively high loading of Personal Unconcern on this factor; in other words there exists a commitment to team effort which perhaps indicates a less personally competitive trend in the job experienced individual.

Examination of the mean rank between the As and Bs indicates that the TABP is not associated with promotion. This finding is in agreement with Cooper et al. (1981) who with reference to the Western Collaborative Group Study stated that "persons in top management may be less likely to exhibit Type A behaviour than their counterparts in middle management" (p. 1211). These authors continued by asking, "Do individuals change from Type A to Type B as they achieve top management positions?" (p. 1211). The answer, it is suggested, is not that such individuals change, but that given the control associated with high rank, Type A behaviour is not so readily apparent and is no



longer so appropriate. The focus, as noted, has changed to a struggle towards health, and with regard to the work environment further advancement may depend on more subtle techniques. In any case, the important issue is that physiological risk of CHD is present in the job experienced individual -perhaps as a delayed effect of Type A behaviour, or perhaps because the more subtle techniques used to advance even higher are equally stressful.

This last comment points to the failure of cross sectional studies, including this one, to find any Type A/B differences on the basis of standard physiological risk factors under conditions of experimentally induced stress (reviewed by Matthews, 1982). That is, although acute differences in blood pressures, etc. between Type As and Type Bs are not obvious at the time of research, chronic differences may emerge later when Type A behaviour itself is either no longer as apparent or, as stated, is focused away from typical areas toward those which are insensitive to present assessment tools such as the JAS and the structured interview. That health becomes more of an issue suggests that controllability remains a matter of prime concern to the Type A and therefore may represent a measure more permanently associated, in a temporal sense, to CHD.

Finally, and central to this research, was the positive association of Controllability, to the TABP and its non-negative association with physiological risk - the only factor so associated. Pertinent are the recent findings of Rhodewalt & Davison (1983)

who hypothesized that the hyper-responsiveness of Type As to the loss of control which occurs in settings other than those involving uncontrollable stress may involve "cognitive-perceptual differences between As and Bs in the way they perceive threats to control" (p. 221) and that these differences are "self-attributional".

Utilizing a choice elimination reactance paradigm they concluded that the "Type As' sensitivity to threats to their control is related to their tendency to view themselves as casual for the outcomes" (p. 226). That is, Type As interpret seemingly neutral situations as defined by Bs as threatening to their sense of control. These authors then cite Lazarus indicating, as was noted in this introduction, that a stress experience includes an event being appraised as harmful followed by a coping strategy. It is agreed, then, that the attempt to regain control represents this coping strategy which triggers the "physiological responses that have long term effects upon the individual's cardiovascular system" (Rhodewalt and Davison, p. 221). Similarly Matthews (1982) suggested that Type As may lack clear internal standards for guiding their behaviour, indicating that research is needed to examine the process by which Type As engage in a process of self-evaluation. In other words, although As may be internal, their strategies may be inappropriate. Rhodewalt and Davison's contention that Type As interpret their environment differently gains support within this factor and from the findings that satisfaction with social support is less for such individuals notwithstanding a significantly greater amount of actual support.

### DIFFERENCES BETWEEN TYPE A AND TYPE B SUBJECTS

With reference to job involvement, interesting differences between Type As and Bs were noted on the JIS (Lodahl and Kejner, 1965). These authors described job involvement as "the degree to which a person is identified psychologically with his work, or the importance of work to his total self image" (p. 24). The reference to self image is particularly relevant in the context of differences between other variables used in this research (see following discussion) but in itself points to the Type A's concern with self-esteem. The competitiveness of the Type A individual may drive his effort in this regard although he reported no greater satisfaction with work.

Of greater importance, however, were the results pertaining to social support. Type As, as noted earlier, reported a nonsignificant but greater number of significant others in their support environment than Type Bs, yet were significantly less satisfied with it. Possibly a lack of satisfaction in the social milieu maintains an overall low self image which causes the Type A to compensate in the workplace. Certainly the differences between Type As and Bs on those scales pertaining to work style point to a constant struggle on the part of the Type A. Other significant differences pertinent to this argument relate to the Type A's internal locus of control. The Type A's internal tendency, then, may to some degree prohibit the recognition of social reinforcement which in turn drives him to seek positive regard from the work environment.

Finally the results of the physiological measures have significance and pertain to earlier discussion concerning the independence

between the TABP and the standard risk factors. Specifically, as has been reported previously (Rosenman and Chesney, 1980), Type As had slightly higher mean blood pressures than Type Bs, but contrary to the findings of research summarized by these authors, cholesterol level tended to be higher in Type B individuals. Indeed when physiological measures were combined, Type As had a significantly better trend (i.e. improving). Possibly, given the mean age of the sample, health related concerns were important for both As and Bs, but the drive of the Type A influenced diet and exercise habits to a greater extent. To repeat, those features of the TABP which cause pathology early in life may to some degree, alleviate that trend later on. Contrary to these observations pertaining to Type As in general, those Type As at high physiological risk smoked more and exercised less than other Type As. Such results add weight to the contention that there exists a sub-population of As, not necessarily related to extreme scores, who are somehow different from their peers and who are at the greatest risk of CHD.

As mentioned, scales relating to locus of control generally supported the contention of Glass (1974) that Type As are internal in comparison to Bs. This trend was also noted for the extreme subjects on the AB and PR dimensions. Thus the argument presented earlier - that under salient stress, internal Type As are at the greatest risk of CHD - gains support in contrast to the alternate hypothesis that it is external Type As who are at risk. In fact there was no evidence to suggest that Type As, extreme or otherwise, are externals. Keenan and

McBain (1979) found no such interaction between the TABP and locus of control, perhaps because stress levels were different between the two samples, perhaps because the use of Rotter's single scale camouflaged the difference pertaining to internality. Further, the sample of Keenan and McBain consisted of middle managers in a civilian industry who presumably were in such a position out of choice, in comparison to the sample under consideration in this research which consisted of officers posted into their respective positions from field commands where there was more autonomy. Hence for the subjects examined here, stress may well have been greater and thus acted as the catalyst for the observed results.

#### IMPLICATIONS FOR TREATMENT

The above discussion implicated a cognitive element to the risk of CHD - Controllability. Specifically a subgroup of Type A individuals were identified on the basis of PR scores and were deemed to be at high overall risk of CHD. It was found that group members had a distinct need to control their environment. The question is, what can be done to reduce the risk?

First of all, those individuals with the cognitive-perceptual difference should be identified. This research, contrary to that of Rhodewalt and Davison, argues that the issue is not to identify Type As who view themselves as casual to outcomes related to loss of control, but to identify those who require unrealistic control regardless of the Type A or Type B category. (Whether the Type B high PR or the Type A low PR subgroup ultimately succumb to CHD in equal numbers to

the Type A high PR subgroup requires longitudinal investigation, the intended follow-up to this study.) Stated differently, the perception of lack of control (found in only 5 out of 64 subjects, 4 of whom were identified as Type A/high PR) is tentatively suggested to have more predictive power of CHD than measures such as the JAS. Matthews (1982) stated "it would be beneficial to develop and include in the assessment battery of future studies measures of the various psychological dimensions proposed to underlie the Type A construct (e.g. a measure of sensitivity to loss of control). By so doing, a more direct test of the importance of these dimensions can be made" (p. 316). This research attempted to accomplish this, albeit with relatively crude presently existing indicators of the importance of control. That such measures identified Type A/high PR individuals points to the urgency for the development of a refined controllability scale.

Returning to the question of intervention, the relationship of the perception of control to sympathetic hyperactivity requires comment. Matthews reviewing the data, argued that actively coping with stress increases sympathetic activity and the discharge of catecholamines which in turn elevates blood pressure and increases the rate of arterial damage, induces myocardial lesion, potentiates the aggregation of blood platelets and facilitates fatal cardiac arrhythmias. Catecholamines, she continued, promote lipid mobilization which triggers a chain of events which results in elevated levels of very-

low-density lipoprotein - a positive correlate of CHD. Finally, Matthews pointed to data which "show that severe depletion of norepinephrine, with a possible shift to parasympathetic dominance, is often associated with helplessness and giving up" (p. 308). This behavioural feature has been noticed in some Type As after prolonged stress. Lovallo (1978) summarized relevant research as follows "In general the results lend some support to the idea that As react with more helplessness than Bs following severe uncontrollability" (p. 87).

It is argued, then, that some individuals, usually Type As, tend to perceive certain situations, particularly related to the workplace, as being out of control; but, being generally internal with reference to locus of control, attribute the loss of control to themselves, rather than to the influence of powerful others or fate for example. They then attempt coping strategies which result in the sympathetic hyperactivity which is implicated in cardiovascular disease (Engel 1970, Glass, 1977). The degree to which individuals behave in this manner lies on a continuum; but the continuum, it is argued, is not related to the extremity or non-extremity of AB scores - rather it is related to tendency to lack a self-attribution of control under salient conditions. It was pointed out that Type As tend to shift the focus from the workplace to health related issues as age increases, thus their Type A-ness eventually may reduce physiological risk.

The above observations points to means of intervention. It is argued that the dramatic rise in the incidence of CHD in this century indicates predominantly environmental casual factors. For example,

competitiveness and the need to control is instilled in members of the Western civilization from birth - in school, in sports and eventually in the workplace. It is constantly encouraged. Stated differently, it is constantly modelled - one of the most powerful learning procedures according to social learning theory. The need to control, for some individuals, then, is generalized to inappropriate situations, to situations where there is no gain. In other words the need to control becomes a phobia - it is irrational. Further it is argued that this syndrome is maintained because the struggle yields immediate, although temporary, relief in comparison to withdrawing from the struggle, which causes helplessness and depression (Seligman, 1975). Treatment then should involve those procedures offering success for phobic behaviour, reviewed extensively elsewhere (e.g. Wilson & O'Leary, 1980) but including (a) relaxation training to reduce the stress of withdrawing from the situation perceived as eliciting the control response, and (b) cognitive restructuring targetted towards substituting alternate and reinforcing ideation which is directed towards health improving behaviours such as exercise - in sum a cognitive/behavioural approach.

Such treatment is more appropriate than, for example, the compulsory exercise programmes currently implimented by the Canadian Forces, for two reasons. First, the likelihood of exercise programmes being adhered to is minimal because they remove the individual from the salient struggle (control in the workplace) against his wishes - hence added stress is generated. Secondly, and of greater importance, the suggested treatment offers gain for both employer and employee.



That is, the implementation of such a programme would not only emphasize employer concern for the employee but would primarily increase the perception of control. A greater sense of control would decrease the struggle "against the system" and thus increase efficiency pertaining to the task. Finally, increased efficiency should not be rewarded by increased workload but by encouraging voluntary participation in physical exercise - an activity which as argued earlier further enhances the perception of control.<sup>1</sup>

#### CONCLUDING STATEMENT

This research identified controllability as a prime factor related to the onset of CHD. Specifically it identified those subjects who were Type A individuals at high physiological risk of developing CHD. This finding points to the need to develop a scale more pertinent to the assessment of the individual's perceived (self-attributed) need to control. It is argued that such a measure would, as hypothesized, more accurately identify that subgroup of Type As and perhaps others who, without intervention would develop CHD. Indeed it may be that the Type A assessment is redundant.

It was further argued that an unrealistic need to control represents an unrealistic fear of the lack of control and thus may be classified as a phobia, suitable for treatment by behavioural and cognitive methods. Finally, it was argued that employees and employers, especially large organizations such as the Canadian Forces, would benefit from such treatment.

<sup>1</sup>These arguments, it is emphasized, pertain only to staff (management) positions and not to field occupations within the Canadian Forces where physical condition is mandatory for survival.

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Appendix A

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Letter to Potential Subjects

\*

I would like to thank you for taking a few minutes to read this explanation of the intended study.

Medical and psychological research has identified stress as contributing to a great number of diseases; for example, to ulcers, coronary heart disease and migraine headaches. Some people, however, are more prone to stress than others, although they may not be aware of it. Various measures of such proneness have been tried over the years, and include paper and pencil questionnaires and doctor-patient interviews. One goal of this study is to refine the paper and pencil measures by including other questions related to potentially contributing mechanisms.

It is hoped, then, that such a refinement will more accurately identify those who may be susceptible to stress, and also indicate means of coping with it. Hence the overall goal is to promote health.

To accomplish this goal it is necessary to compare questionnaire results to specific items from medical records related to cholesterol levels, serum lipid levels, blood pressure, heart rate, EKG irregularities, ulcers, migraine attacks, and pertinent surgery. At this point I would like to emphasize that all information will be anonymous. At the time of testing a number will be chosen by you, known only to a staff member of the Base Hospital. At a later date, hospital personnel will attach medical data to the battery of written questions. Therefore, as far as this research team is concerned, you will be represented by only rank and a number, not by name.

Permission was granted to approach the officers of Air Command with the purpose of taking part in this study for three reasons:

1. it is extremely rare to obtain a population of achievement oriented personnel who have standard medical records.
2. the officers of Air Command work in a somewhat stressful environment - at least more so than those of lower rank - and such an environment is essential to the aims of the study; and
3. the results of the study may have implications for improving the health of all military members.

Finally, although permission to complete this study has been granted by the Commander of Air Command, the Surgeon General and the Command Surgeon, it is nevertheless subject to your volunteering to take part. In total the battery will take approximately one to two hours to complete at a time convenient to you.

Appendix B

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Jenkin's Activity Survey

JENKINS ACTIVITY SURVEY

Age	

Male Female 

The Jenkins Activity Survey asks questions about aspects of behaviour that have been found helpful in medical diagnosis. Each person is different, so there are no "right" or "wrong" answers.

For each questions, choose the answer that is true for you, and fill in the space in front of that answer. Use a black lead pencil, and make your marks heavy and dark. Mark only one answer for each question. If you change your mind, erase the old mark completely.

Do not make any stray marks.

1. Do you ever have trouble finding time to get your hair cut or styled?
  - A  Never
  - B  Occasionally
  - C  Almost always
  
2. How often does your job "stir you into action"?
  - A  Less often than most people's jobs
  - B  About average
  - C  More than most people's jobs
  
3. Is you everyday life filled mostly by
  - A  problems needing a solution?
  - B  challenges needing to be met?
  - C  a rather predictable routing of events?
  - D  not enough things to keep me interested or busy?



4. Some people live a calm, predictable life. Others often find themselves facing unexpected changes, frequent interruptions, inconveniences, or "things going wrong." How often are you faced with these minor (or major) annoyances or frustrations?
- A  Several times a day
- B  About once a day
- C  A few times a week
- D  Once a week
- E  Once a month or less
5. When you are under pressure or stress, what do you usually do?
- A  Do something about it immediately
- B  Plan carefully before taking action
6. Ordinarily, how rapidly do you eat?
- A  I'm usually the first one finished.
- B  I eat a little faster than average.
- C  I eat at about the same speed as most people.
- D  I eat more slowly than most people.
7. Has your spouse or a friend ever told you that you eat too fast?
- A  Yes, often
- B  Yes, once or twice
- C  No, never
8. How often do you find yourself doing more than one thing at a time, such as working while eating, reading while dressing, or figuring out problems while driving?
- A  I do things at once whenever practical.
- B  I do this only when I'm short of time.
- C  I rarely or never do more than one thing at a time.

9. When you listen to someone talking, and this person takes too long to come to the point, how often do you feel like hurrying the person along?
- A  Frequently
- B  Occasionally
- C  Almost never
10. How often do you actually "put words in the person's mouth" in order to speed things up?
- A  Frequently
- B  Occasionally
- C  Almost never
- 
11. If you tell your spouse or a friend that you will meet somewhere at a definite time, how often do you arrive late?
- A  Once in a while
- B  Rarely
- C  I am never late.
12. How often do you find yourself hurrying to get places even when there is plenty of time?
- A  Frequently
- B  Occasionally
- C  Almost never
13. Suppose you are to meet someone at a public place (street corner, building lobby, restaurant) and the other person is already 10 minutes late. What will you do?
- A  Sit and wait
- B  Walk about while waiting
- C  Usually carry some reading matter or writing paper so I can get something done while waiting

14. When you have to "wait in line" at a restaurant, a store, or the post office, what do you do?
- A  Accept it calmly
  - B  Feel impatient but not show it
  - C  Feel so impatient that someone watching can tell I am restless
  - D  Refuse to wait in line, and find ways to avoid such delays
15. When you play games with young children about 10 years old (or when you did so in past years), how often do you purposely let them win?
- A  Most of the time
  - B  Half the time
  - C  Only occasionally
  - D  Never
16. When you were younger, did most people consider you to be
- A  definitely hard-driving and competitive?
  - B  probably hard-driving and competitive?
  - C  probably more relaxed and easygoing?
  - D  definitely more relaxed and easygoing?
17. Nowadays, do you consider yourself to be
- A  definitely hard-driving and competitive?
  - B  probably hard-driving and competitive?
  - C  probably more relaxed and easygoing?
  - D  definitely more relaxed and easygoing?
18. Would your spouse (or closest friend) rate you as
- A  definitely hard-driving and competitive?
  - B  probably hard-driving and competitive?
  - C  probably relaxed and easygoing?
  - D  definitely relaxed and easygoing?

19. Would your spouse (or closet friend) rate your general level of activity as
- A  too slow - should be more active?
  - B  about average - busy much of the time?
  - C  too active - should slow down?
20. Would people you know well agree that you take your work too seriously?
- A  Definitely yes
  - B  Probably yes
  - C  Probably no
  - D  Definitely no
21. Would people you know well agree that you have less energy than most people?
- A  Definitely yes
  - B  Probably yes
  - C  Probably no
  - D  Definitely no
22. Would people you know well agree that you tend to get irritated easily?
- A  Definitely yes
  - B  Probably yes
  - C  Probably no
  - D  Definitely no
23. Would people who know you well agree that you tend to do most things in a hurry?
- A  Definitely yes
  - B  Probably yes
  - C  Probably no
  - D  Definitely no

24. Would people who know you well agree that you enjoy a "contest" (competition) and try hard to win?
- A  Definitely yes
- B  Probably yes
- C  Probably no
- D  Definitely no
25. How was your temper when you were younger?
- A  Fiery and hard to control
- B  Strong but controllable
- C  No problem
- D  I almost never got angry.
26. How is your temper nowadays?
- A  Fiery and hard to control
- B  Strong but controllable
- C  No problem
- D  I almost never get angry.
27. When you are in the midst of doing a job and someone (not your boss) interrupts you, how do you usually feel inside?
- A  I feel O.K. because I work better after an occasional break.
- B  I feel only mildly annoyed.
- C  I really feel irritated because most such interruptions are unnecessary.
28. How often are there deadlines on your job?
- A  Daily or more often
- B  Weekly
- C  Monthly or less often
- D  Never

29. These deadlines usually carry
- A  minor pressure because of their routine nature.
  - B  considerable pressure, since delay would upset my entire work group.
  - C  Deadlines never occur on my job.
30. Do you ever set deadlines or quotas for yourself at work or at home?
- A  No
  - B  Yes, but only occasionally
  - C  Yes, once a week or more
31. When you have to work against a deadline, what is the quality of your work?
- A  Better
  - B  Worse
  - C  The same (Pressure makes no difference.)
32. At work, do you ever keep two jobs moving forward at the same time by shifting back and forth rapidly from one to the other?
- A  No, never
  - B  Yes, but only in emergencies
  - C  Yes, regularly
33. Are you content to remain at your present job level for the next five years?
- A  Yes
  - B  No, I want to advance.
  - C  Definitely no, I strive to advance and would be dissatisfied if not promoted
34. If you had your choice, which would you rather get?
- A  A small increase in pay without a promotion to a higher level job
  - B  A promotion to a higher level job without an increase in pay

35. In the past three years, have you ever taken less than your allotted number of vacation days?

A  Yes

B  No

C  My type of job does not provide regular vacations.

36. In the last three years, how has your personal yearly income changed?

A  It has remained the same or gone down.

B  It has gone up slightly (as the result of cost-of-living increases or automatic raises based on years of service).

C  It has gone up considerably.

37. How often do you bring your work home with you at night, or study materials related to your job?

A  Rarely or never

B  Once a week or less

C  More than once a week

38. How often do you go to your place of work when you are not expected to be there (such as nights or weekends)?

A  It is not possible on my job.

B  Rarely or never

C  Occasionally (less than once a week)

D  Once a week or more

39. When you find yourself getting tired on the job, what do you usually do?

A  Slow down for a while until my strength comes back

B  Keep pushing myself at the same pace in spite

40. When you are in a group, how often do the other people look to you for leadership?
- A  Rarely
  - B  About as often as they look to others
  - C  More often than they look to others
41. How often do you make yourself written lists to help you remember what needs to be done?
- A  Never
  - B  Occasionally
  - C  Frequently

For questions 42-46, compare yourself with the average worker in your present occupation, and mark the most accurate description.

42. I amount of effort put forth, I give
- A  much more effort.
  - B  a little more effort.
  - C  a little less effort.
  - D  much less effort.
43. In sense of responsibility, I am
- A  much more responsible.
  - B  a little more responsible.
  - C  a little less responsible.
  - D  much less responsible.
44. I find it necessary to hurry
- A  much more of the time.
  - B  a little more of the time.
  - C  a little less of the time.
  - D  much less of the time.



45. In being precise (careful about detail), I am

- A  much more precise.
- B  a little more precise.
- C  a little less precise.
- D  much less precise.

46. I approach life in general

- A  much more seriously.
- B  a little more seriously.
- C  a little less seriously.
- D  much less seriously.

For questions 47-49, compare your present work with your work setting of five years ago. If you have not been working for five years, compare your present job with your first job.

47. I worked more hours per week

- A  at my present job.
- B  five years ago.
- C  Cannot decide

48. I carried more responsibility

- A  at my present job.
- B  five years ago.
- C  Cannot decide

49. I was considered to be at higher level (in prestige or social position)

- A  at my present job.
- B  five years ago.
- C  Cannot decide

50. How many different job titles have you held in the last 10 years?  
(Be sure to count shifts in kinds of work, shifts to new employers,  
and shifts up and down within a firm.)

- A  0-1
- B  2
- C  3
- D  4
- E  5 or more

51. How much schooling did you receive?

- A  0-4 years
- B  5-8 years
- C  Some high school
- D  Graduated from high school
- E  Trade school or business college
- F  Some college (including junior college)
- G  Graduated from a four-year college
- H  Post-graduate work at a college or university

52. When you were in school, were you an officer of any group, such as a student council, glee club, 4-H club, sorority or fraternity, or captain of an athletic team?

- A  No
- B  Yes, I held one such position.
- C  Yes, I held two or more such positions.

Appendix C

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The Job Involvement Scale

JOB INVOLVEMENT QUESTIONNAIRE

The following statements refer to job involvement. Please indicate whether you:

1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree

That is, circle the appropriate number opposite each statements.

- |  |   |   |   |   |
|--|---|---|---|---|
| 1. I'll stay overtime to finish a job, even if I'm not paid for it.      | 1 | 2 | 3 | 4 |
| 2. You can measure a person pretty well by how good a job he does.       | 1 | 2 | 3 | 4 |
| 3. The major satisfaction in my life comes from my job.                  | 1 | 2 | 3 | 4 |
| 4. For me, mornings at work really fly by.                               | 1 | 2 | 3 | 4 |
| 5. I usually show up for work a little early, to get things ready.       | 1 | 2 | 3 | 4 |
| 6. The most important things that happen to me involve my work.          | 1 | 2 | 3 | 4 |
| 7. Sometimes I lie awake at night thinking ahead to the next day's work. | 1 | 2 | 3 | 4 |
| 8. I'm really a perfectionist about my work.                             | 1 | 2 | 3 | 4 |
| 9. I feel depressed when I fail at something connected with my job.      | 1 | 2 | 3 | 4 |
| 10. I have other activities more important than my work.                 | 1 | 2 | 3 | 4 |
| 11. I live, eat, and breathe my job.                                     | 1 | 2 | 3 | 4 |
| 12. I would probably keep working even if I didn't need the money        | 1 | 2 | 3 | 4 |
| 13. Quite often I feel like staying home from work instead of coming in. | 1 | 2 | 3 | 4 |

- |   |   |   |   |   |
|---|---|---|---|---|
| 14. To me, my work is only a small part of who I am.                                  | 1 | 2 | 3 | 4 |
| 15. I am very much involved personally in my work.                                    | 1 | 2 | 3 | 4 |
| 16. I avoid taking on extra duties and responsibilities in my work.                   | 1 | 2 | 3 | 4 |
| 17. I used to be more ambitious about my work than I am now.                          | 1 | 2 | 3 | 4 |
| 18. Most things in life are more important than work.                                 | 1 | 2 | 3 | 4 |
| 19. I used to care more about my work, but now other things are more important to me. | 1 | 2 | 3 | 4 |
| 20. Sometimes I'd like to kick myself for the mistakes I make in my work.             | 1 | 2 | 3 | 4 |

Appendix D

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The Multidimensional Locus of Control Scale

I, P, AND C SCALES

CODE NUMBER: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Directions:

On the next page is a series of attitude statements. Each represents a commonly held opinion. There are no right or wrong answers. You will probably agree with some items and disagree with others. We are interested in the extent to which you agree or disagree with such matters of opinion.

Read each statement carefully. Then indicate the extent to which you agree or disagree by circling the number following each statement. The numbers and their meanings are indicated below:

If you agree strongly: circle +3  
If you agree somewhat: circle +2  
If you agree slightly: circle +1

If you disagree slightly: circle -1  
If you disagree somewhat: circle -2  
If you disagree strongly: circle -3

First impressions are usually best. Read each statement, decide if you agree or disagree and the strength of your opinion, and then circle the appropriate number.

I, P AND C SCALES

	Strongly Disagree	Disagree Somewhat	Slightly Disagree	Slightly Agree	Agree Somewhat	Strongly Agree
1. Whether or not I get to be a leader depends mostly on my ability.	-3	-2	-1	+1	+2	+3
2. To a great extent my life is controlled by accidental happenings.	-3	-2	-1	+1	+2	+3
3. I feel like what happens in my life is mostly determined by powerful people.	-3	-2	-1	+1	+2	+3
4. Whether or not I get into a car accident depends mostly on how good a driver I am.	-3	-2	-1	+1	+2	+3
5. When I make plans, I am almost certain to make them work.	-3	-2	-1	+1	+2	+3
6. Often there is no chance of protecting my personal interests from bad luck happenings.	-3	-2	-1	+1	+2	+3
7. When I get what I want, it's usually because I'm lucky.	-3	-2	-1	+1	+2	+3
8. Although I might have good ability, I will not be given leadership responsibility without appealing to those in positions of power.	-3	-2	-1	+1	+2	+3
9. How many friends I have depends on how nice a person I am.	-3	-2	-1	+1	+2	+3
10. I have often found that what is going to happen will happen.	-3	-2	-1	+1	+2	+3
11. My life is chiefly controlled by powerful others.	-3	-2	-1	+1	+2	+3
12. Whether or not I get into a car accident is mostly a matter of luck.	-3	-2	-1	+1	+2	+3



	Strongly Disagree	Disagree Somewhat	Slightly Disagree	Slightly Agree	Agree Somewhat	Strongly Agree
13. People like myself have very little chance of protecting our personal interests when they conflict with those of strong pressure groups.	-3	-2	-1	+1	+2	+3
14. It's not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune.	-3	-2	-1	+1	+2	+3
5. Getting what I want requires pleasing those people above me.	-3	-2	-1	+1	+2	+3
6. Whether or not I get to be a leader depends on whether I'm lucky enough to be in the right place at the right time.	-3	-2	-1	+1	+2	+3
7. If important people were to decide they didn't like me, I probably wouldn't make many friends.	-3	-2	-1	+1	+2	+3
3. I can pretty much determine what will happen in my life.	-3	-2	-1	+1	+2	+3
9. I am usually able to protect my personal interests.	-3	-2	-1	+1	+2	+3
10. Whether or not I get into a car accident depends mostly on the other driver.	-3	-2	-1	+1	+2	+3
11. When I get what I want, it's usually because I worked hard for it.	-3	-2	-1	+1	+2	+3
12. In order to have my plans work, I make sure that they fit in with the desires of people who have power over me.	-3	-2	-1	+1	+2	+3
13. My life is determined by my own actions.	-3	-2	-1	+1	+2	+3
14. It's chiefly a matter of fate whether or not I have a few friends or many friends.	-3	-2	-1	+1	+2	+3

Appendix E

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The Multidimensional Health Locus of Control Scale

MHLC

This is a questionnaire designed to determine the way in which different people view certain important health-related issues. Each item is a belief statement with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item we would like you to circle the number that represents the extent to which you disagree or agree with the statement. The more strongly you agree with a statement, then the higher will be the number you circle. The more strongly you disagree with a statement, then the lower will be the number you circle. Please make sure that you answer every item and that you circle only one number per item. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

Please answer these items carefully, but do not spend too much time on any one item. As much as you can, try to respond to each item independently. When making your choice, do not be influenced by your previous choices. It is important that you respond according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe.

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
If I get sick, it is my own behaviour which determines how soon I get well again.	1	2	3	4	5	6
No matter what I do, if I am going to get sick, I will get sick.	1	2	3	4	5	6
Having regular contact with my physician is the best way for me to avoid illness.	1	2	3	4	5	6
Most things that affect my health happen to me by accident.	1	2	3	4	5	6
Whenever I don't feel well, I should consult medically trained professional.	1	2	3	4	5	6
I am in control of my health.	1	2	3	4	5	6
My family has a lot to do with my becoming sick or staying healthy.	1	2	3	4	5	6
When I get sick I am to blame.	1	2	3	4	5	6
Luck plays a big part in determining how soon I will recover from an illness.	1	2	3	4	5	6
Health professionals control my health.	1	2	3	4	5	6
My good health is largely a matter of good fortune.	1	2	3	4	5	6

2. The main thing which affects my health is what I myself do.	1	2	3	4	5	6
3. If I take care of myself, I can avoid illness.	1	2	3	4	5	6
4. When I recover from an illness, it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.	1	2	3	4	5	6
5. No matter what I do, I'm likely to get sick.	1	2	3	4	5	6
6. If it's meant to be, I will stay healthy.	1	2	3	4	5	6
7. If I take the right actions, I can stay healthy.	1	2	3	4	5	6
8. Regarding my health, I can only do what my doctor tells me to do.	1	2	3	4	5	6

Appendix F

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The Minnesota Satisfaction Questionnaire

MINNESOTA SATISFACTION QUESTIONNAIRE

On the following pages you will find statements about your present job.

Read each statement carefully.

Decide how satisfied you feel about the aspect of your job described by the statement.

Keeping the statement in mind:

- if you feel that your job gives you more than you expected, check the box under "VS" (Very Satisfied);
- if you feel that your job gives you what you expected, check the box under "S." (Satisfied);
- if you cannot make up your mind whether or not the job gives you what you expected, check the box under "N" (Neither Satisfied nor Dissatisfied);
- if you feel that your job gives you less than you expected, check the box under "DS" (Dissatisfied).

Remember: Keep the statement in mind when deciding how satisfied you feel about that aspect of your job.

Do this for all statements. Please answer every item.

Be frank and honest. Give a true picture of your feelings about your present job.

Note: You may feel that certain questions relate to "loyalty" e.g. question 30. For the purposes of the questionnaire it does not; we are only interested in how various categories of dissatisfaction relate to physiological stress symptoms. Indeed we are not concerned with individual responses.

Ask yourself: How satisfied am I with this aspect of my job?

VS means I am very satisfied with this aspect of my job.

S means I am satisfied with this aspect of my job.

N means I can't decide whether I am satisfied or not with this aspect of my job.

DS means I am dissatisfied with this aspect of my job.

VDS means I am very dissatisfied with this aspect of my job.

=====

On my present job, this is how I feel about...	VDS	DS	N	S	VS
1. The chance to be of service to others.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. The chance to try out some of my own ideas.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Being able to do the job without feeling it is morally wrong.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The chance to work by myself.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The variety in my work.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. The chance to have other workers look to me for direction.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The chance to do the kind of work that I do best.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. The social position in the community that goes with the job.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. The policies and practices toward employees of this company.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. The way my supervisor and I understand each other.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My job security.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. The amount of pay for the work I do.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. The working conditions (heating, lighting, ventilation, etc.) on this job.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. The opportunities for advancement on this job.....
15. The technical "know-how" of my supervisor.....
16. The spirit of cooperation among my co-workers..
17. The chance to be responsible for planning my work.....
18. The way I am noticed when I do a good job.....
19. Being able to see the results of work I do.....
20. The chance to be active much of the time.....
21. The chance to be of service to people.....
22. The chance to do new and original things on my own.....
23. Being able to do things that don't go against my religious beliefs.....
24. The chance to work alone on the job.....
25. The chance to do different things from time to time.....
26. The chance to tell other workers how to do things.....
27. The chance to do work that is well suited to my abilities.....
28. The chance to be "somebody" in the community.....
29. Company policies and the way in which they are administered.....
30. The way my boss handles his men.....
31. The way my job provides for a secure future....
32. The chance to make as much money as my friends.....



33. The physical surroundings where I work.....
34. The chances of getting ahead on this job.....
35. The competence of my supervisor in making decisions.....
36. The chance to develop close friendships with my co-workers.....
37. The chance to make decisions on my own.....
38. The way I get full credit for the work I do....
39. Being able to take pride in a job well done....
40. Being able to do something much of the time....
41. The chance to help people.....
- 
42. The chance to try something different.....
43. Being able to do things that don't go against my conscience.....
44. The chance to be alone on the job.....
45. The routine in my work.....
46. The chance to supervise other people.....
47. The chance to make use of my best abilities....
48. The chance to "rub elbows" with important people.....
49. The way employees are informed about company policies.....
50. The way my boss backs his men up (with top management).....
51. The way my job provides for steady employment..
52. How my pay compares with that for similar jobs in other companies.....

- 53. The pleasantness of the working conditions.....
- 54. The way promotions are given out on this job...
- 55. The way my boss delegates work to others.....
- 56. The friendliness of my co-workers.....
- 57. The chance to be responsible for the work  
of others.....
- 58. The recognition I get for the work I do.....
- 59. Being able to do something worthwhile.....
- 60. Being able to stay busy.....
- 61. The chance to do things for other people.....

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- 62. The chance to develop new and better ways to  
do the job.....
- 63. The chance to do things that don't harm other  
people.....
- 64. The chance to work independently of other.....
- 65. The chance to do something different every day.
- 66. The chance to tell people what do to.....
- 67. The chance to do something that makes use of  
my abilities.....
- 68. The chance to be important in the eyes of  
others.....
- 69. The way company policies are put into practice.
- 70. The way my boss takes care of complaints  
brought to him by his men.....
- 71. How steady my job is.....
- 72. My pay an the amount of work I do.....

73. The physical working conditions of the job.....
74. The chances for advancement on this job.....
75. The way my boss provides help on hard problems.
76. The way my co-workers are easy to make  
friends with.....
77. The freedom to use my own judgment.....
78. The way they usually tell me when I do  
my job well.....
79. The chance to do my best at all times.....
80. The chance to be "on the go" all the time.....
- 
81. The chance to be of some small service to  
other people.....
82. The chance to try my own methods of doing the  
job.....
83. The chance to do the job without feeling I  
am cheating anyone.....
84. The chance to work away from others.....
85. The chance to do many different things on  
the job.....
86. The chance to tell others what to do.....
87. The chance to make use of my abilities and  
skills.....
88. The chance to have a definite place in the  
community.....
89. The way the company treats its employees.....
90. The personnel relationship between my boss  
and his men.....
91. The way layoffs and transfers are avoided  
in my job.....

92. How my pay compares with that of other workers.
93. The working conditions.....
94. My chances for advancement.....
95. The way my boss trains his men.....
96. The way my co-workers get along with each  
other.....
97. The responsibility of my job.....
98. The praise I get for doing a good job.....
99. The feeling of accomplishment I get from  
the job.....
- 
100. Being able to keep busy all the time.....

Appendix G

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The Work and Family Orientation Questionnaire-II

WORK AND FAMILY ORIENTATION QUESTIONNAIRE

The following scale describes attitudes towards various situations related to the work place as well as to other situations. Please indicate whether you strongly agree, slightly agree, neither agree nor disagree, slightly disagree, or strongly disagree with each comment.

1. I would rather work in a situation where group effort is stressed and more important rather than one in which my individual effort is stressed.

A                      B                      C                      D                      E

---

Strongly agree	Slightly agree	Neither agree nor disagree	Slightly disagree	Strongly disagree
-------------------	-------------------	-------------------------------	----------------------	----------------------

2. I more often attempt difficult tasks that I am not sure I can do than easier tasks I believe I can do.

A                      B                      C                      D                      E

---

Strongly agree	Slightly agree	Neither agree nor disagree	Slightly disagree	Strongly disagree
-------------------	-------------------	-------------------------------	----------------------	----------------------

3. It is very important for me to do my work as well as I can even if it isn't popular with my co-workers.

A                      B                      C                      D                      E

---

Strongly agree	Slightly agree	Neither agree nor disagree	Slightly disagree	Strongly disagree
-------------------	-------------------	-------------------------------	----------------------	----------------------

4. I would rather do something at which I feel confident and relaxed than something which is challenging and difficult.

A                      B                      C                      D                      E

---

Strongly agree	Slightly agree	Neither agree nor disagree	Slightly disagree	Strongly disagree
-------------------	-------------------	-------------------------------	----------------------	----------------------

5. I would rather learn fun games that most people know than a difficult thought game.

A                      B                      C                      D                      E

---

Strongly agree      Slightly agree      Neither agree nor disagree      Slightly disagree      Strongly disagree

6. If I am not good at something I would rather keep struggling to master it than move on to something I may be good at.

A                      B                      C                      D                      E

---

Strongly agree      Slightly agree      Neither agree nor disagree      Slightly disagree      Strongly disagree

7. I really enjoy working in situations involving skill and competitions.

A                      B                      C                      D                      E

---

Strongly agree      Slightly agree      Neither agree nor disagree      Slightly disagree      Strongly disagree

8. When a group I belong to plans an activity, I would rather organize it myself than have someone else organize it and just help out.

A                      B                      C                      D                      E

---

Strongly agree      Slightly agree      Neither agree nor disagree      Slightly disagree      Strongly disagree

9. Once I undertake a task, I dislike goofing up and not doing the best job I can.

A                      B                      C                      D                      E

---

Strongly agree      Slightly agree      Neither agree nor disagree      Slightly disagree      Strongly disagree

10. I think more of the future than of the present and past.

A                      B                      C                      D                      E

---

Strongly      Slightly      Neither agree      Slightly      Strongly  
agree          agree          nor disagree      disagree      disagree

11. I hate losing more than I like winning.

A                      B                      C                      D                      E

---

Strongly      Slightly      Neither agree      Slightly      Strongly  
agree          agree          nor disagree      disagree      disagree

12. I worry because my success may cause others to dislike me.

A                      B                      C                      D                      E

---

Strongly      Slightly      Neither agree      Slightly      Strongly  
agree          agree          nor disagree      disagree      disagree

13. It is important to me to perform better than others on a task.

A                      B                      C                      D                      E

---

Strongly      Slightly      Neither agree      Slightly      Strongly  
agree          agree          nor disagree      disagree      disagree

14. I feel that winning is very important in both work and games.

A                      B                      C                      D                      E

---

Strongly      Slightly      Neither agree      Slightly      Strongly  
agree          agree          nor disagree      disagree      disagree



Appendix H

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The Social Support Questionnaire

SOCIAL SUPPORT QUESTIONNAIRE

INSTRUCTIONS

The following questions ask about people in your environment who provide you with help or support. Each question has two parts. For the first part, list all the people you know, excluding yourself, whom you can count on for help or support in the manner described. Give the person's relationship to you (see example). Do not list more than one person next to each of the letters beneath the question.

For the second part, circle how satisfied you are with the overall support you have.

If you have no support for a question, check the words "no one", but still rate your level of satisfaction. Do not list more than nine persons per question.

Please answer all questions as best you can. All your responses will be kept confidential.

EXAMPLE

Ex) Who do you know whom you can trust with information that could get you in trouble?

_____	No one	A) brother	D) father	G)
		B) friend	D) employer	H)
		C) friend	F)	I)

How satisfied?

very	fairly	a little	a little	fairly	very
satisfied	satisfied	satisfied	dissatisfied	dissatisfied	dissatisfied

Note: 1. You may list more than one brother, friend, etc.  
2. Do not use names or military positions.

1. Whom can you really count on to listen to you when you need to talk?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

2. How satisfied?

6) very satisfied	5) fairly satisfied	4) a little satisfied	3) a little dissatisfied	2) fairly dissatisfied	1) very dissatisfied
-------------------	---------------------	-----------------------	--------------------------	------------------------	----------------------

3. Who could you really count on to help you if a person whom you thought was a good friend insulted you and told you that he/she didn't want to see you again?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

4. How satisfied?

6) very satisfied	5) fairly satisfied	4) a little satisfied	3) a little dissatisfied	2) fairly dissatisfied	1) very dissatisfied
-------------------	---------------------	-----------------------	--------------------------	------------------------	----------------------

5. Whose lives do you feel that you are an important part of?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

6. How satisfied?

6) very satisfied	5) fairly satisfied	4) a little satisfied	3) a little dissatisfied	2) fairly dissatisfied	1) very dissatisfied
-------------------	---------------------	-----------------------	--------------------------	------------------------	----------------------

7. Whom do you feel would help you if you were married and had just separated from your spouse?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

8. How satisfied?

6) very satisfied	5) fairly satisfied	4) a little satisfied	3) a little dissatisfied	2) fairly dissatisfied	1) very dissatisfied
-------------------	---------------------	-----------------------	--------------------------	------------------------	----------------------

9. Whom could you really count on to help you out in a crisis situation, even though they would have to go out of their way to do so?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

10. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

11. Whom can you talk with frankly, without having to watch what you say?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

12. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

13. Who helps you feel that you truly have something positive to contribute to others?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

14. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

15. Who can you really count on to distract you from your worries when you feel under stress?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

16. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

17. Who can you really count on to be dependable when you need help?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

18. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

19. Whom could you really count on to help you out if you had just been fired from your job or expelled from school?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

20. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

21. With whom can you totally be yourself?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

22. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

23. Whom do you feel really appreciates you as a person?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

24. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------



33. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

34. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

35. Whom do you feel would help if a family member very close to you died?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

36. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

37. Who accepts you totally, including both your worst and your best points?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

38. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

39. Whom can you really count on to care about you, regardless of what is happening to you?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

40. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

41. Whom can you really count on to listen to you when you are very angry at someone else?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

42. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

43. Whom can you really count on to tell you, in a thoughtful manner, when you need to improve in some way?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

44. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

45. Whom can you really count on to help you feel better when you are feeling generally down-in-the-dumps?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

46. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

47. Whom do you feel truly loves you deeply?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

48. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------



49. Whom can you count on to console you when you are very upset?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

50. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

51. Whom can you really count on to support you in major decisions you make?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

52. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

53. Whom can you really count on to help you feel better when you are very irritable, ready to get angry at almost anything?

_____ No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

54. How satisfied?

6)very satisfied	5)fairly satisfied	4)a little satisfied	3)a little dissatisfied	2)fairly dissatisfied	1)very dissatisfied
---------------------	-----------------------	-------------------------	----------------------------	--------------------------	------------------------

Appendix I

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Demographic Data Form

Six-digit identification numbers:

Please give the following information:

1. Age
2. Rank
3. Sex
4. Number of cigarettes smoked per day
5. A brief statement of total weekly excercises

In addition indicate whether any near blood relatives have, to your knowledge, suffered from heart attacks, stroke or any other cardiovascular disorders.

Yes

No

Appendix J

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Medical Data Form

e/Rank:

Selected Code Numbers (Six Digits):

I agree to allow the following information, taken from medical records by hospital personnel, to be used as part of a study correlating physiology measures with environmental stress:

Signature: \_\_\_\_\_

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Blood Pressure:											
Systolic											
Diastolic											
Cholesterol Levels:											
Glucose Intolerance:											
Abnormalities:											

Please enclose and seal this sheet in the envelope marked Base Surgeon.

Appendix K

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Tables of Results

	AGE	RA	SM	EX	HIS	GEFT
AGE	1.00000 0.0000	0.43974 0.0003	-0.02606 0.8380	0.00864 0.9460	-0.13614 0.2834	-0.12261 0.3345
RA	0.43972 0.0003	1.00000 0.0000	-0.09481 0.4561	0.06486 0.6106	-0.12958 0.3075	0.00892 0.9442
SM	-0.02606 0.8380	-0.09481 0.4561	1.00000 0.0000	-0.33535 0.0068	0.10847 0.3936	-0.02429 0.8489
EX	0.00864 0.9460	0.06486 0.6106	-0.33535 0.0068	1.00000 0.0000	0.02598 0.8385	0.08321 0.5133
HIS	-0.13614 0.2834	-0.12958 0.3075	0.10847 0.3936	0.02598 0.8385	1.00000 0.0000	0.05580 0.6614
GEFT	-0.12261 0.3345	0.00892 0.9442	-0.02429 0.8489	0.08321 0.5133	0.05580 0.6614	1.00000 0.0000
JIS	0.27374 0.0286	0.21211 0.0924	-0.12336 0.3315	0.10428 0.4122	-0.13353 0.2928	-0.18490 0.1436
GSAT	0.17602 0.1641	0.28468 0.0226	0.14137 0.2652	0.13531 0.2854	-0.08863 0.4861	-0.16573 0.1906
ISAT	0.16344 0.1969	0.25661 0.0407	0.05185 0.6841	0.25335 0.0434	-0.07873 0.5363	-0.19233 0.1279
ESAT	0.09660 0.4476	0.24174 0.0543	0.15669 0.2163	-0.02360 0.8532	-0.11593 0.3617	-0.07856 0.5372
WP	0.32192 0.0095	0.12908 0.3094	0.03883 0.7606	-0.02025 0.8738	0.11012 0.3864	0.12057 0.3426
WW	-0.15246 0.2291	-0.07368 0.5629	-0.17588 0.1645	0.32186 0.0095	0.22372 0.0756	0.11767 0.3544
WM	-0.25764 0.0398	-0.24275 0.0533	0.11533 0.3642	0.15845 0.2111	0.03586 0.7785	0.24268 0.0533
WC	-0.08317 0.5135	-0.019719 0.1183	0.11998 0.3450	0.07261 0.5686	0.01020 0.9362	0.00402 0.9749
PS	-0.17165 0.1750	0.03530 0.7818	-0.00136 0.9915	0.06532 0.6081	0.04831 0.7046	-0.02927 0.8184

Table 1 Pearson Product Moment Correlations

	JIS	GSAT	ISAT	ESAT	WP	WW
AGE	0.27374 0.0286	0.17602 0.1641	0.16344 0.1969	0.09660 0.4476	0.32192 0.0095	-0.15246 0.2291
RA	0.21211 0.0924	0.28468 0.0226	0.25661 0.0407	0.24174 0.0543	0.12908 0.3094	-0.07368 0.5629
SM	-0.12336 0.3315	0.14137 0.2652	0.05185 0.6841	0.15669 0.2163	0.03883 0.7606	-0.17588 0.1645
EX	0.10428 0.4122	0.13531 0.2864	0.25335 0.0434	-0.02360 0.8532	-0.02025 0.8737	0.32186 0.0095
HIS	-0.13353 0.2928	-0.08863 0.4861	-0.07873 0.5363	-0.11593 0.3617	0.11012 0.3864	0.22372 0.0756
GEFT	-0.18400 0.1432	-0.16573 0.1906	-0.19233 0.1279	-0.07856 0.5372	0.12057 0.3426	0.11767 0.3544
JIS	1.00000 0.0000	0.25778 0.0397	0.37045 0.0026	0.08336 0.5126	0.09582 0.4513	0.16210 0.2006
GSAT	0.25778 0.0397	1.00000 0.0000	0.91482 0.0001	0.86842 0.0001	0.15954 0.2079	-0.07212 0.5712
ISAT	0.37045 0.0026	0.91482 0.0001	0.00000 0.000	0.62205 0.0001	0.13634 0.2827	0.05637 0.6582
ESAT	0.08336 0.5126	0.86842 0.0001	0.62205 0.0001	1.00000 0.0000	0.07158 0.5741	-0.22275 0.0769
WP	0.09582 0.4513	0.15954 0.2079	0.13634 0.2827	0.07158 0.5741	1.00000 0.0000	-0.05437 0.6696
WW	0.16210 0.2006	-0.07212 0.5712	0.05637 0.6582	-0.22275 0.0769	-0.05437 0.6696	1.00000 0.0000
WM	0.16463 0.1936	0.13850 0.2751	0.15546 0.2199	0.07957 0.5320	-0.02418 0.8496	0.52700 0.0001
WC	0.30341 0.0148	0.11442 0.3680	0.10087 0.4277	0.06418 0.6144	-0.09126 0.4733	0.24103 0.0550
PS	-0.07704 0.5451	-0.01825 0.8862	-0.04846 0.7037	-0.00066 0.9959	-0.07533 0.5488	0.02912 0.8193

Table 1 (Continued)



	AGE	RA	SM	EX	HIS	GEFT
SS	0.03189 0.8025	0.24694 0.0492	-0.22248 0.0772	0.21779 0.0838	-0.07377 0.5624	0.07243 0.5695
MLC-I	0.19395 0.1256	0.23632 0.0601	0.05730 0.6529	-0.00137 0.9914	-0.09426 0.4588	0.09179 0.4707
MLC-P	-0.03510 0.7831	-0.09417 0.4592	0.05679 0.6558	-0.14092 0.2667	0.29132 0.0195	0.09838 0.4393
MLC-C	-0.01694 0.8943	-0.15711 0.2150	0.01808 0.8872	-0.24869 0.0475	-0.20260 0.1084	0.25456 0.0424
MHLC-I	0.24346 0.0526	0.21466 0.0885	0.04022 0.7524	0.19496 0.1226	-0.05209 0.6827	-0.03857 0.7622
MHLC-P	-0.04181 0.7429	-0.13248 0.2967	-0.00687 0.9570	0.05470 0.6677	0.04198 0.7419	0.13177 0.2993
MHLC-C	-0.21258 0.0917	-0.01528 0.9046	0.08954 0.4817	-0.05969 0.6394	0.01434 0.9105	0.06714 0.5981
SBP	0.00132 0.9918	-0.11659 0.3589	-0.21418 0.8892	0.08798 0.4894	0.04680 0.7134	-0.02200 0.8630
DBP	-0.03908 0.7592	-0.14135 0.2652	-0.21960 0.0812	-0.01790 0.8884	0.12819 0.3217	0.06901 0.5879
Cl	0.07018 0.5816	-0.09929 0.4351	0.04295 0.7361	-0.17194 0.1743	-0.02289 0.8575	-0.08408 0.5089
PR	0.73422 0.0001	0.16979 0.1798	0.07555 0.5529	-0.07931 0.5333	-0.07483 0.5567	-0.13868 0.2744
TR	-0.02304 0.8566	0.04125 0.7462	-0.20208 0.1093	-0.02016 0.8744	-0.09928 0.4351	0.06717 0.5980
JAS-AB	-0.07751 0.5426	0.01925 0.8800	0.08799 0.4893	0.16152 0.2023	-0.04208 0.7413	0.09719 0.4449
JAS-J	0.03850 0.7626	0.28512 0.0224	-0.10372 0.4147	0.19662 0.1194	-0.14697 0.2465	0.00480 0.9700
JAS-H	-0.06591 0.6049	-0.04662 0.7145	-0.03271 0.7975	0.23486 0.0617	0.03985 0.7546	0.17849 0.1582
JAS-S	-0.00554 0.9654	-0.08932 0.4828	-0.06488 0.6105	0.14744 0.2450	-0.09010 0.4789	-0.05908 0.6429

Table 1 (continued)

	JI	GSAT	ISAT	ESAT	WP	WW
SS	-0.33280 0.0072	0.03332 0.7938	0.01387 0.9140	0.04333 0.7339	0.10952 0.3890	-0.12519 0.3243
MLC-I	0.13077 0.3030	-0.00175 0.9890	0.03268 0.7977	-0.07256 0.5688	0.12540 0.3235	0.08200 0.5195
MLC-P	0.08659 0.4963	-0.10934 0.3898	-0.11156 0.3802	-0.03667 0.7736	-0.18332 0.1471	-0.23113 0.0661
MLC-C	-0.22624 0.0722	-0.03840 0.7632	-0.12778 0.3143	0.07897 0.5351	0.00572 0.9642	-0.15428 0.2235
MHLC-I	0.13774 0.2777	-0.07245 0.5694	-0.03238 0.7995	-0.14824 0.2424	-0.00516 0.9677	0.04240 0.7394
MHLC-P	0.20120 0.1109	-0.13462 0.2889	-0.16028 0.2058	-0.06656 0.6013	-0.09814 0.4404	0.30129 0.0155
MHLC-C	-0.06264 0.6229	0.11636 0.3598	0.02918 0.8189	0.16343 0.1969	0.09928 0.4351	0.06129 0.6304
SBP	0.05878 0.6445	0.03380 0.7909	0.01837 0.8855	0.02217 0.8619	-0.10362 0.4152	0.18819 0.1364
DBP	0.05788 0.6496	-0.14498 0.2530	-0.11846 0.3512	-0.15139 0.2324	-0.06169 0.6282	0.23620 0.0602
CI	0.14379 0.2570	-0.08492 0.5046	-0.07786 0.5408	-0.05480 0.6671	0.02070 0.8710	0.05838 0.6468
PR	0.21072 0.0947	0.07190 0.5723	0.05390 0.6723	0.03678 0.7729	0.22001 0.0807	0.03101 0.8078
TR	-0.05647 0.6576	-0.07791 0.5406	-0.07026 0.5812	0.03027 0.8123	-0.09912 0.4359	0.19595 0.1207
JAS-AB	0.41842 0.0006	0.14179 0.2637	0.20418 0.1056	0.01117 0.9302	-0.12556 0.3229	0.21144 0.0935
JAS-J	0.42240 0.0005	0.36386 0.0031	0.38045 0.0019	0.28836 0.0208	0.04087 0.7485	-0.13707 0.2801
JAS-H	0.39866 0.0011	0.14024 0.2690	0.24755 0.0486	-0.04731 0.7105	-0.05489 0.6666	0.43855 0.0003
JAS-S	0.39447 0.0013	0.08990 0.4799	0.07075 0.5785	0.09891 0.4368	-0.27614 0.0272	0.06025 0.6363

Table 1 (Continued)

	WM	WC	PS	SS	MLC-I	MLC-P
AGE	-0.25764 0.0398	-0.08317 0.5135	-0.17165 0.1750	0.03189 0.8025	0.19395 0.1246	-0.03510 0.7831
RA	-0.24275 0.0533	-0.19719 0.1183	0.03530 0.7818	0.24694 0.0492	0.23632 0.0601	-0.09417 0.4592
SM	0.11533 0.3642	0.111998 0.3450	-0.00136 0.9915	-0.22248 0.0772	0.05730 0.6529	0.05679 0.6558
EX	0.15845 0.2111	0.07261 0.5686	0.06532 0.6081	0.21779 0.0838	-0.00137 0.9914	-0.14092 0.2667
HIS	0.03586 0.7785	0.01020 0.9362	0.04831 0.7046	-0.07377 0.5424	-0.09426 0.4588	-0.29132 0.0195
GEFT	0.24268 0.0533	0.00402 0.9749	-0.02927 0.8184	0.07243 0.5695	0.09179 0.4707	0.09838 0.4393
JIS	0.16463 0.1936	0.30341 0.0148	-0.07704 0.5451	-0.33280 0.0072	0.13077 0.3030	0.08659 0.4963
GSAT	0.13850 0.2751	0.11442 0.3680	-0.01825 0.8862	0.03332 0.7938	-0.00175 0.9890	-0.10934 0.3898
ISAT	0.15546 0.2199	0.10087 0.4277	-0.04846 0.7037	0.01376 0.9140	0.03268 0.7977	-0.11156 0.3802
ESAT	0.07957 0.5320	0.06418 0.6144	-0.00066 0.9959	0.04333 0.7339	-0.07256 0.5688	-0.03667 0.7736
WP	-0.02418 0.8497	-0.09126 0.4733	0.07633 0.5488	0.10952 0.3890	0.12540 0.3235	-0.18332 0.1471
WW	0.52700 0.0001	0.24103 0.0550	0.02912 0.8193	-0.12519 0.3243	0.08200 0.5195	-0.23113 0.0661
WM	1.00000 0.0000	0.45959 0.0001	0.15509 0.2211	-0.12088 0.3413	0.01079 0.9325	-0.14132 0.2653
WC	0.45959 0.0001	1.00000 0.0000	0.04589 0.7188	-0.40272 0.0010	0.13888 0.2737	0.14717 0.2459
PS	0.15509 0.2211	0.04589 0.7188	1.00000 0.0000	0.16691 0.1874	0.27112 0.0302	-0.19816 0.1165

Table 1 (continued)

	MLC-C	MHLC-I	MHLC-P	MHLC-C	SBP	DBP
AGE	-0.01694 0.8943	0.24346 0.0526	-0.04181 0.7429	-0.21258 0.0917	0.00132 0.9918	-0.03908 0.7592
RA	-0.15711 0.2150	0.21466 0.0885	-0.13248 0.2967	-0.01528 0.9046	-0.11659 0.3589	-0.14135 0.2652
SM	0.01808 0.8872	0.04022 0.7524	-0.00687 0.9570	0.08954 0.4817	-0.21418 0.0892	-0.21960 0.0812
EX	-0.24869 0.0475	0.19496 0.1226	0.05470 0.6677	-0.05969 0.6394	0.08798 0.4894	-0.01790 0.8884
HIS	-0.20260 0.1084	0.05209 0.6827	0.04198 0.7419	0.01434 0.9105	0.04680 0.7134	0.12819 0.3127
GEFT	0.25456 0.0424	-0.03857 0.7622	0.13177 0.2993	0.06715 0.5981	-0.02200 0.8630	0.06901 0.5879
JIS	-0.22624 0.0722	0.13774 0.2777	0.20120 0.1109	-0.06264 0.6229	0.05878 0.6445	0.05788 0.6496
GSAT	-0.03840 0.7632	-0.07245 0.5694	-0.13462 0.2889	0.11636 0.3598	0.03380 0.7909	-0.14498 0.2530
ISAT	-0.12778 0.3143	-0.03238 0.7995	-0.16028 0.2058	0.02918 0.8189	0.01837 0.8855	-0.11846 0.3512
ESAT	0.07897 0.5351	-0.14824 0.2424	-0.06656 0.6013	0.16343 0.1969	0.02217 0.8619	-0.15139 0.2324
WP	0.00572 0.9642	-0.00516 0.9677	-0.09814 0.4404	0.09928 0.4351	-0.10362 0.4152	-0.06169 0.6282
WW	-0.15428 0.2235	0.04240 0.7394	0.30129 0.0155	0.06129 0.6304	0.18819 0.1364	0.23620 0.0602
WM	-0.18395 0.1457	0.03454 0.7865	0.18576 0.1417	-0.12008 0.3446	0.26928 0.0314	0.24831 0.0479
WC	-0.14176 0.2638	0.06552 0.6070	0.30854 0.0131	0.05297 0.6777	0.00595 0.9628	0.03603 0.7775
PS	-0.12752 0.3153	0.08299 0.5144	0.28055 0.0247	0.04275 0.7373	0.04215 0.7408	0.06311 0.6203

Table 1 (continued)

	WM	WC	PS	SS	MLC-I	MLC-P
SS	-0.12088 0.3413	-0.40272 0.0010	0.16691 0.1874	1.00000 0.0000	0.04324 0.7344	-0.27746 0.0264
MLC-I	0.01079 0.9325	0.13888 0.2737	0.27112 0.0302	0.04324 0.7344	1.00000 0.0000	-0.13443 0.2896
MLC-P	-0.14132 0.2653	0.14717 0.2459	-0.19816 0.1165	-0.27746 0.0264	-0.13443 0.2896	1.00000 0.0000
MLC-C	-0.18395 0.1457	-0.14176 0.2638	-0.12752 0.3153	-0.11645 0.3595	-0.23633 0.0601	0.35356 0.0042
MHLC-I	0.03454 0.7864	0.06552 0.6070	0.08299 0.5144	-0.03013 0.8132	0.37948 0.0020	-0.04560 0.7205
MHLC-P	0.18576 0.1417	0.30854 0.0131	0.28055 0.0247	-0.21250 0.0918	-0.02762 0.8285	0.23796 0.0583
MHLC-C	-0.12008 0.3446	0.05297 0.6777	0.04275 0.7373	0.11936 0.3475	-0.12643 0.3195	0.29667 0.0173
SBP	0.26928 0.0314	0.00595 0.9628	0.04215 0.7408	-0.23376 0.0630	-0.21225 0.0922	0.03996 0.7539
DBP	0.24831 0.0479	0.03603 0.7775	0.06311 0.6203	-0.19607 0.1205	-0.18420 0.1451	0.04314 0.7350
CL	0.05082 0.6901	0.06094 0.6324	-0.02373 0.8523	-0.10515 0.4083	-0.15435 0.2233	0.27725 0.0266
PR	0.05717 0.6536	-0.00478 0.9701	-0.13061 0.3036	-0.06803 0.5933	0.06451 0.6126	0.06691 0.5994
TR	0.15327 0.2260	-0.14142 0.2650	0.05043 0.6923	-0.01668 0.8959	-0.05142 0.6865	0.00653 0.5884
JAS-AB	0.26809 0.0322	0.38040 0.0019	-0.02108 0.8687	-0.24250 0.0535	0.12774 0.3144	-0.19664 0.1194
JAS-J	0.04734 0.7103	0.10910 0.3908	0.17022 0.1787	-0.00005 0.9997	0.03706 0.7713	-0.10499 0.4090
JAS-H	0.39734 0.0012	0.54836 0.0001	0.13946 0.2717	-0.24909 0.0472	0.12168 0.3382	-0.11099 0.3826
JAS-S	0.07968 0.5314	0.22781 0.0702	-0.15940 0.2083	-0.24354 0.0525	-0.12739 0.3158	0.14653 0.2479

Table 1 (continued)

	MLC-C	MHLC-I	MHLC-P	MHLC-C	SBP	DBP
SS	-0.11645 0.3595	-0.03013 0.8132	-0.21250 0.0918	0.11936 0.3475	-0.23376 0.0630	-0.19607 0.1205
MLC-I	-0.23633 0.0601	0.37948 0.0020	-0.02762 0.8285	-0.12643 0.3195	-0.21225 0.0922	-0.18420 0.1451
MLC-P	0.35356 0.0042	-0.04560 0.7205	0.23796 0.0583	0.29667 0.0173	0.03996 0.7539	0.04314 0.7350
MLC-C	1.00000 0.0000	-0.22474 0.0742	0.11918 0.3483	0.33036 0.0077	-0.03343 0.7931	-0.13101 0.3021
MHLC-I	-0.22474 0.0742	1.00000 0.0000	-0.11125 0.3815	-0.38283 0.0018	0.17391 0.1693	-0.01215 0.9241
MHLC-P	0.11918 0.3483	-0.11125 0.3815	1.00000 0.0000	0.31896 0.0102	0.08751 0.4917	0.08332 0.5127
MHLC-C	0.33036 0.0077	-0.38283 0.0018	0.31896 0.0102	1.00000 0.0000	-0.10092 0.4275	-0.04750 0.7094
SBP	-0.03343 0.7931	0.17391 0.1693	0.08751 0.4917	-0.10092 0.4275	1.00000 0.0000	0.67717 0.0001
DBP	-0.13101 0.3021	-0.01215 0.9241	0.08332 0.5127	-0.04750 0.7094	0.67717 0.0001	1.00000 0.0000
CL	0.13031 0.3048	-0.17310 0.1714	0.20260 0.1084	0.29187 0.0193	0.13472 0.2885	0.29003 0.0201
PR	-0.01672 0.8957	0.17342 0.1706	0.05121 0.6878	-0.14309 0.2593	0.29877 0.0165	0.27899 0.0256
TR	0.04947 0.6978	0.06893 0.5884	-0.04271 0.7376	-0.13335 0.2835	0.32763 0.0082	0.18751 0.1378
JAS-AB	-0.17147 0.1755	0.20302 0.1076	0.19152 0.1295	-0.10623 0.4035	0.06541 0.6076	0.09700 0.4458
JAS-J	-0.17310 0.1714	0.04061 0.7500	0.03253 0.7986	0.01932 0.8795	0.12584 0.3218	-0.10457 0.4109
JAS-H	-0.05919 0.6422	0.12244 0.3351	0.23180 0.0653	-0.04612 0.7174	0.08376 0.5105	0.11312 0.3735
JAS-S	-0.09961 0.4336	0.15028 0.2359	0.33478 0.0069	0.05197 0.6834	0.19069 0.1312	0.07884 0.5358

Table 1 (Continued)

	CL	PR	TR	JAS-AB	JAS-J	JAS-H	JAS-S
AGE	0.07018 0.5816	0.73422 0.0001	-0.02304 0.8566	-0.07751 0.5427	0.03850 0.7626	-0.06591 0.6049	-0.00554 0.9654
RA	-0.09929 0.4351	0.16979 0.1798	0.04125 0.7462	0.01925 0.8800	0.28512 0.0224	-0.04662 0.7145	-0.08932 0.4828
SM	0.04295 0.7361	0.07555 0.5529	-0.20208 0.1093	0.08799 0.4893	-0.10372 0.4147	-0.3271 0.7975	-0.06488 0.6105
EX	-0.17194 0.1743	-0.07931 0.5333	-0.02016 0.8744	0.16152 0.2023	0.19662 0.1194	0.23486 0.0617	0.14744 0.2450
HIS	-0.02289 0.8575	-0.07483 0.5567	-0.09928 0.4351	-0.04208 0.7413	-0.14697 0.2465	0.03985 0.7546	-0.09010 0.4789
GEFT	-0.08408 0.5089	-0.13868 0.2744	0.06717 0.5980	0.09719 0.4449	0.00480 0.9700	0.17849 0.1582	-0.05908 0.6429
JIS	0.14379 0.2570	0.21072 0.0947	-0.05647 0.6576	0.41842 0.0006	0.42240 0.0005	0.39866 0.0011	0.39447 0.0013
GSAT	-0.08492 0.5046	0.07190 0.5723	-0.07791 0.5406	0.14179 0.2637	0.36386 0.0031	0.14024 0.2690	0.08990 0.4799
ISAT	-0.07786 0.5408	0.05390 0.6723	-0.07026 0.5812	0.20418 0.1056	0.38045 0.0019	0.24755 0.0486	0.07075 0.5785
ESAT	-0.05480 0.6671	0.03678 0.7729	0.03027 0.8123	0.01117 0.9302	0.28836 0.0208	-0.04731 0.7105	0.09891 0.4368
WP	0.02070 0.8710	0.22001 0.0807	-0.09912 0.4359	-0.12556 0.3229	0.04087 0.7485	-0.05489 0.6666	-0.27614 0.0272
WW	0.05838 0.6468	0.03101 0.8078	0.19595 0.1207	0.21144 0.0935	-0.13707 0.2801	0.43844 0.0003	0.06025 0.6363
WM	0.05082 0.6901	0.05717 0.6536	0.15327 0.2266	0.26809 0.0322	0.04753 0.7103	0.39734 0.0012	0.07968 0.5314
WC	0.06094 0.6324	-0.00478 0.9701	-0.14142 0.2650	0.38040 0.0019	0.10910 0.3908	0.54836 0.0001	0.22781 0.0702
PS	-0.02373 0.8523	-0.13061 0.3036	0.05043 0.6923	-0.02108 0.8687	0.17022 0.1787	0.13946 0.2717	-0.15940 0.2083

Table 1 (continued)

	CL	PR	TR	JAS-AB	JAS-J	JAS-H	JAS-S
SS	-0.10515 0.4083	-0.06803 0.5933	-0.01668 0.8959	-0.24250 0.0535	-0.00005 0.9997	-0.24909 0.0472	-0.24354 0.0525
MLC-I	-0.15435 0.2233	0.06451 0.6126	-0.05142 0.6865	0.12774 0.3144	0.03706 0.7713	0.12168 0.3382	-0.12739 0.3158
MLC-P	0.27725 0.0266	0.06691 0.5994	0.00653 0.9592	-0.19664 0.1194	-0.10499 0.4090	-0.11099 0.3826	0.14653 0.2479
MLC-C	0.13031 0.3048	-0.01672 0.8957	0.04947 0.6978	-0.17147 0.1755	-0.17310 0.1714	-0.05919 0.6422	-0.09961 0.4336
MHLC-I	-0.17310 0.1714	0.17342 0.1706	0.06893 0.5884	0.20302 0.1076	0.04061 0.7500	0.12244 0.3351	0.15028 0.2359
MHLC-P	0.20260 0.1084	0.05121 0.6878	-0.04271 0.7376	0.19152 0.1295	0.03253 0.7986	0.23180 0.0653	0.33478 0.0069
MHLC-C	0.29187 0.0193	-0.14309 0.2593	-0.13335 0.2935	-0.10623 0.4035	0.01932 0.8795	-0.04612 0.7174	0.05197 0.6834
SBP	0.13472 0.2885	0.29877 0.0165	0.32763 0.0082	0.06541 0.6076	0.12584 0.3218	0.08376 0.5105	0.19069 0.1312
DBP	0.29003 0.0201	0.27899 0.0256	0.18751 0.1379	0.09700 0.4418	-0.10457 0.4109	0.11312 0.3735	0.07884 0.5358
CL	1.00000 0.0000	0.51615 0.0001	0.14018 0.2692	-0.17117 0.1762	-0.14800 0.2432	-0.04919 0.6995	-0.07312 0.5658
PR	0.51615 0.0001	1.00000 0.0000	0.17526 0.1660	-0.10960 0.3886	-0.05678 0.6559	-0.08290 0.5149	-0.07436 0.5593
TR	0.14018 0.2692	0.17526 0.1660	1.009000 0.0000	-0.17446 0.1680	0.07017 0.5816	0.06343 0.6185	-0.13365 0.2924
JAS-AB	-0.17117 0.1762	-0.10960 0.3886	-0.17446 0.1680	1.00000 0.0000	0.30495 0.0143	0.62207 0.0001	0.62001 0.0001
JAS-J	-0.14800 0.2432	-0.05678 0.6559	0.07017 0.5816	0.30495 0.0143	1.00000 0.0000	0.24328 0.0527	0.17579 0.1647
JAS-H	-0.04919 0.6995	-0.08290 0.5149	0.06343 0.6185	0.62207 0.0001	0.24328 0.0527	1.00000 0.0000	0.21763 0.0841
JAS-S	-0.07312 0.5658	-0.07436 0.5593	-0.13365 0.2924	0.62001 0.0001	0.17579 0.1647	0.21763 0.0841	1.00000 0.0000

Table 1 (continued)



	FACTOR I	FACTOR II	FACTOR III	FACTOR IV	FACTOR V	FACTOR VI	FACTOR VII	FACTOR VIII	FACTOR IX	FACTOR X
AGE	0.076	-0.134	0.025	-0.128	0.808	0.039	-0.019	-0.051	-0.160	-0.068
RA	0.273	-0.188	-0.106	-0.127	0.585	-0.047	0.245	-0.138	0.180	-0.008
SM	0.145	0.054	-0.240	-0.034	-0.078	-0.045	-0.742	0.164	0.057	0.026
EX	0.116	0.249	-0.050	-0.126	-0.012	0.151	0.705	0.112	0.001	0.037
HLS	-0.121	0.066	0.114	0.037	-0.068	-0.022	-0.059	0.790	-0.011	0.002
GEFT	-0.119	0.183	0.015	-0.002	0.021	-0.056	0.085	0.030	0.033	0.864
JLS	0.206	0.405	0.052	0.018	0.457	0.456	0.063	-0.140	-0.051	-0.313
GSAT	0.959	0.086	-0.048	0.043	0.122	0.007	-0.026	0.028	-0.038	-0.066
ISAT	0.856	0.207	-0.067	-0.005	0.160	0.003	0.108	0.024	-0.107	-0.161
ESAT	0.881	-0.089	0.003	0.098	-0.010	-0.003	-0.134	-0.066	0.032	0.049
WP	0.128	-0.026	-0.045	0.137	0.585	-0.234	-0.071	0.398	0.047	0.225
WW	-0.159	0.730	0.164	0.096	-0.032	-0.136	0.341	0.174	-0.052	-0.020
WM	0.159	0.732	0.246	-0.081	-0.244	-0.133	-0.040	0.076	0.100	0.104
WC	0.056	0.701	-0.105	0.027	-0.071	0.307	-0.254	-0.045	0.054	-0.071
PS	-0.004	0.062	0.061	0.042	-0.073	-0.087	0.006	0.076	0.894	-0.037
SS	0.068	-0.347	-0.248	0.051	-0.005	-0.383	0.539	0.065	0.248	0.041
MLC-I	-0.112	0.243	-0.323	-0.330	0.392	-0.133	-0.094	-0.109	0.434	-0.008
MLC-P	-0.145	-0.071	0.042	0.339	0.008	-0.324	-0.266	-0.533	-0.174	0.162
MLC-C	-0.020	-0.173	-0.020	0.387	-0.059	-0.040	-0.194	-0.328	-0.226	0.551
MHLC-I	-0.141	0.097	0.069	-0.644	0.312	0.150	-0.017	-0.114	0.173	-0.003
MHLC-P	-0.202	0.318	0.071	0.468	0.002	0.458	-0.008	-0.024	0.339	0.119
MHLC-C	0.101	-0.042	-0.136	0.799	-0.047	0.100	0.014	0.004	0.135	0.153
SEP	0.073	0.046	0.890	-0.106	-0.054	0.150	0.045	-0.001	0.029	0.035
DEP	-0.152	0.117	0.826	0.071	0.003	0.035	0.015	0.137	-0.002	-0.047
CL	-0.156	0.120	0.316	0.604	0.203	-0.152	-0.188	-0.185	-0.051	-0.276
TR	0.004	0.108	0.494	-0.097	-0.047	-0.397	0.139	-0.433	0.063	0.059
JAS-J	0.503	0.014	0.053	-0.115	0.109	0.342	-0.215	-0.124	0.348	0.016
JAS-H	0.110	0.748	0.012	-0.084	0.029	0.207	0.100	-0.016	0.078	0.116
JAS-S	0.077	0.115	0.093	-0.051	-0.102	0.800	0.099	-0.059	-0.101	-0.061
Variance Explained	3.118	2.883	2.224	2.161	1.996	1.950	1.873	1.593	1.534	1.422

Table 2 Rotated (Varimax) Factor Pattern

	FACTOR I	FACTOR II	FACTOR III	FACTOR IV	FACTOR V	FACTOR VI	FACTOR VII	FACTOR VIII
	Controlla-	Locus of	Inherita-	Health	Job	Social	Field	
	bility	Control	bility	Habits	Experience	Support	Dependence	Trend
WC	.764	-	-	-	-	-	-	-
SS	.638	-	-	.437	-	-	-	-
WM	.619	-	-	-	-	-	-	-
JIS	.585	-	-	-	.503	-	-	-
WW	.559	-	-	-	-	-	-	-
MHC-P	.538	.427	-	-	-	.428	-	-
MHC-I	-	-.751	-	-	-	-	-	-
MHC-C	-	-.738	-	-	-	-	-	-
MLC-I	-	-.523	-	-	-	.452	-	-
MLC-P	-	-	.756	-	-	-	-	-
HIS	-	-	-.713	-	-	-	-	-
EX	-	-	-	.820	-	-	-	-
SM	-	-	-	-.697	-	-	-	-
WP	-	-	-	-	.686	-	-	-
RA	-	-	-	-	.666	-	-	-
PS	-	-	-	-	-	.886	-	-
GEFT	-	-	-	-	-	-	.891	-
TR	-	-	-	-	-	-	-	.899
MLC-C	-	.454	.438	-	-	-	-	-
Variance	2.478	1.984	1.788	1.697	1.441	1.433	1.393	1.270
Explained								

Table 3 Sorted Rotated (Vasimax) Factor  
Pattern - Reduced Data.

Standard Coefficients for Canonical Variables for  
AB and PR Scores (CNVRF). Mean = 1, Standard  
Deviation = 1.

	CNVRF(1)
PR	0.407
JAS-AB Score	0.951

Standardized Coefficients for Canonical Variables  
for Factor Scores (CNVRS). Mean = 0, Standard  
Deviation = 1.

	CNVRS(1)
Factor I	0.819
II	-0.427
III	-0.010
IV	0.131
V	0.274
VI	-0.148
VII	-0.101
VIII	-0.119

Canonical Correlation between CNVRF(1) and CNVRS(1)  
= .887,  $p \leq .023$

Canonical Correlation between CNVRF(2) and CNVRS(2)  
= .602,  $p \leq .437$

Table 4 Canonical Correlations between JAS - AB/PR Scores,  
and Subject Factor Scores for First Eight Factors -  
Reduced Data.