Type A Behavior, Physiological Reactivity, and Hostility: A Comparison of Three Approaches to the Assessment of Type A Behavior

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Abstract

Sixty-six male university students who had been previously classified as Type A or Type B on the basis of the Structured Interview (SI; Rosenman, 1978) were further classified on two additional measures of Type A behavior: the Survey of Work Styles (SWS; Mavrogiannis & Jackson, 1987) and a peer report measure adapted from the SWS. Fitness scores from the previous study (Dion, 1989) and Hostility as measured by the Cook-Medley Hostility scale (Cook & Medley, 1954) were included as additional independent variables. Bleeding time thromboxane and prostacyclin metabolites, in response to a standardized vascular injury, were measured in all subjects during baseline and immediately following a stressful color naming task. Heart rate (HR), diastolic (DBP), and systolic blood pressure (SBP) were also measured in the previous measure. The results indicated that the overlap between the three measures of Type A behavior was minimal. Categorization of Type A behavior by the SI and SWS was associated with increased production of bleeding time thromboxane but often such effects depended on low fitness level. Although fitness and stress level influenced the cardiovascular measures as expected, none of the Type A behavior measures produced consistent effects on these variables. The implications of the Type A behavior pattern (TABP) association with blood platelet measures, and the dependence of that association on other variables was discussed as were the measurement issues raised by the present study.

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Historical Overview of Coronary-Prone Behavior

The concept of a coronary-prone personality has historical antecedents dating back to the 16th century. William Harvey in 1628 observed emotions and personality attributes to be associated with changes in cardiovascular functioning, stating "A mental disturbance provoking pain, excessive joy, hope, or anxiety extends to the heart, where it affects its temper and rate, impairing general nutrition and vigor" (p.186). Two centuries later, John Hunter exclaimed "My life is in the hands of any rascal who chooses to annoy or tease me" (Dictionary of National Biography, 1975, p.290). Following a heated argument at a hospital board meeting, the eminent physician died suddenly!

In 1868, Von Dusch, a German physician noted that among behavior characteristics, excessive work involvement seemed typical of individuals who developed coronary heart disease (CHD; Chesney & Rosenman, 1980). Sir William Osler described coronary-prone individuals as "...the robust, the vigorous in mind and body, the keen and ambitious man, the indicator of whose engines are set full speed ahead" (1910, p. 839). The Menningers reported their CHD patients as having strong aggressive tendencies (1936). Soon afterwards,

coronary-prone individuals were described as hard-driving, goal-oriented individuals (Arlow, 1945; Dunbar, 1943). Work patterns were observed in young CHD patients as hard-driving, excessively long and strenuous with fewer vacation periods by Gertler and White (1954).

Type A Behavior: Definitional Issues

However, knowledge of personality characteristics did not enhance the predictability of new cases of CHD until the emergence of the Type A Behavior Pattern (TABP) by Friedman and Rosenman (1959). According to these cardiologists, TABP is an action-emotion complex involving a strong desire to compete, an extraordinary need for recognition and advancement, a habitual intense drive to accomplish poorly defined goals, extreme mental and physical alertness, persistent vigorous acceleration of mental or physical activity, and an incessant time-urgent behavior linked to deadlines (Rosenman, 1986). It is not unusual for a Type A individual to be overcommitted to either professional or vocational achievement at the expense of other facets of life. In contrast, the noncoronary behavior pattern Type B is defined as the relative absence of TABP characteristics (Matthews & Haynes, 1986). Individuals displaying Type B behavior characteristics tend to be unhurried, more relaxed, less easily provoked to anger, and speak and gesture with smooth modulation (Friedman, Brown, & Rosenman, 1969; Jenkins, 1979).

A common misconception of researchers is to regard Type A behavior as sole reflection of a personality trait. Type A behavior pattern is not a set of personality characteristics that invariantly lead to behavioral and physiological responses. Rather, TABP is a set of predispositions that interact with specific types of eliciting situations, including those that are challenging and stressful (Matthews & Haynes, 1986). In summary, Type A behavior is a pattern of intense and substantial behavior activation that is the product of a person-by-environment interaction.

According to a number of studies (see Rosenman, 1986), TABP is associated with a high incidence of CHD. Ironically, in a success-oriented society Type A behavior is not perceived as a clinical problem, but rather as adaptive and rewarding. This may account for the rapid increase in CHD incidence in acculturated societies.

Type A Behavior and Coronary Heart Disease

Epidemiological Evidence. Type A behavior, as an epidemiological variable, gained credibility following its initial demonstration in significantly predicting heart diseases in two large scale, well executed prospective studies, namely the Western Collaborative Group Study (WCGS; Rosenman, Brand, Sholtz, & Friedman, 1976) and the Framingham Heart Study (FHS; Haynes, Feinleib, & Kannel, 1980).

The WCGS examined approximately 3200 initially healthy men for 8.5 years, beginning in 1960. The final follow up report demonstrated that men assessed as Type As by the SI at entry were more than twice as likely (2.2) to develop CHD than Type Bs (Rosenman, et al., 1976). When simultaneous statistical adjustments were made for other risk factors for CHD, the risk associated with Type A still persisted. The Jenkins Activity Survey, a self-administered questionnaire developed to mimic the SI, was also administered to the WCGS subjects. Individuals with scores in the upper third of the study's distribution, showed a risk ratio of 1.8 to CHD as compared to those in the lower third (Jenkins, Rosenman, & Zyzanski, 1974).

The FHS assessed healthy male and female subjects holding either white or blue collar occupations. An eight year follow up demonstrated that scores on a self-report measure, the Framingham Type A Scale (FTAS) emerged as an independent predictor of myocardial infarction and CHD in white collar men (2.9) as well as angina and CHD in women working outside the home (Haynes, Feinleib, & Kannel, 1980). Furthermore, men and women who self-reported low levels of anger to others were shown at increased risk of CHD.

Other studies which have provided support for the association between viewing Type A behavior and CHD in high risk populations were the Belgian-French Pooling Project (BFPP) and the Recurrent Coronary Prevention Project (RCPP). The BFPP used the Bortner Type A self-rating scale and found that the incidence of CHD was associated

with Type A behavior pattern (risk ratio=1.8; BFPP, 1984). The RCPP (Friedman, Thoressen, Gill, Powell, Ulmer, Thompson, Price, Rabin, Breall, & Dixon, 1984) was a clinical trial designed to determine whether behavior modification via cognitive-social learning approach of TABP would lower the recurrence of CHD in postinfarction subjects. Results demonstrated a significantly lower recurrence rate in the intervention group relative to the cardiology only group and provided indirect support for viewing TABP as a maintenance factor for CHD in high risk populations.

Replication Failure of Recent Type A Studies. Several recent studies have been unable to replicate the above findings. For instance, a recent report from the WCGS (Ragland & Brand, 1988) demonstrated that the SI was not a significant predictor in a multianalyses of CHD mortality after either 8.5 years or 22 years of follow-up of men. Also, the Honolulu Heart Study (Cohen & Reed, 1985) tested 2,200 healthy men of Japanese descent via the Jenkins Activity Survey (JAS) and followed them for eight years for the development of CHD. This particular sample demonstrated a low incidence of CHD, approximately 50% that of the incidence of CHD of subjects in FHS. Subsequently, no relationship among Type A behavior and angina, myocardial infarction and incidence of total CHD was observed (Cohen & Reed, 1985).

The most compelling negative evidence concerning TABP and its relationship to CHD was demonstrated in the Multiple Risk Factor Intervention Trial (MRFIT; Shekelle, Hulley, Neaton, Billings, Borhani, Gerace, Jacobs, Lasser, Mittlemark, & Stamler, 1985). This clinical study was designed to modify cardiovascular risk factors in high risk men. Initially coronary heart disease free patients were assessed by both the SI and the JAS as either Type A or B. According to the study, no relationship between TABP as defined by either SI or JAS was found with any clinical manifestation of CHD (Shekelle, Hulley, et al., 1985). A detailed study of a subsample of SI from the MRFIT study found a host of measurement and reliability problems in the large scale interviewing process (Scherwitz, 1988). Similar findings were demonstrated by the Aspirin Myocardial Infarction Study (AMIS; Shekelle, Gale, & Norusis, 1985). This study also found no relationship between Type A behavior and CHD.

Why were these recent results inconsistent with previous findings? Matthews (1988) gives the following reasons. First, there may be a higher prevalence of Type As in some studies (ie. higher risk studies MRFIT) as compared to other studies (ie. population based studies) resulting in less variance in the predictive variable which in turn reduces the possibility of finding an association. Second, assessments of high risk subjects may be less reliable due to pharmacological intervention and deliberate attempts by the individual or his/her support network to modify the behavior (Ragland & Brand,

1988). Third, the presentation of mortality data is more likely in high risk studies as compared to population based studies which tend to report morbidity data. Matthews (1988) postulates that Type A may be more related to nonfatal events than to fatal ones. Finally, TABP may influence initial events, not later events. For instance, seven out of nine studies employed CHD patients who had already experienced an initial CHD event (ie. myocardial infarction; see Matthews, 1988).

In summary, high risk studies (and intervention studies) do not seem to demonstrate the association between Type A and CHD as do population based perspective studies. This may be due to the aforementioned difficulties which may play an important role in the findings.

Other Issues Concerning CHD Studies. There are several additional problems in characterizing the Type A-CHD association. The first involves the definition of CHD. Different studies have used different disease endpoints. Yet all refer to CHD. For instance, coronary artery disease (Mehta & Mehta, 1982), myocardial infarction (Friedman et al., 1984), incidence of stroke (Eaker, Feinleib, & Wolf, 1983), angina (Cohen & Reed, 1985), atherosclerosis (Ross & Glomset, 1976), hypertension (Diamond, 1982), and ischemic heart disease (BFPP, 1984) all fall under the general term CHD. Considering the various disease endpoints, each of which may be influenced by different factors, it is important that precise disease endpoints should always be specified.

Perhaps a more serious limitation on many studies (especially intervention studies) is the routine absence of adequate control groups. For instance, Williams and colleagues' (1980) retrospective study only measured patients with the SI after they had been referred to hospital for diagnostic coronary arteriography. They found that hostile Type As had a higher risk of suffering from CHD. Jenkins, Zyzanski, and Rosenman (1976) studied the predictors of recurrence of myocardial infarction in 267 men in the WCGS who had at least one CHD event. The results showed that JAS Type A score was a significant predictor of recurrent myocardial infarction events. Finally, the MRFIT study (previously detailed) used men in the top decile risk for CHD based on their levels of smoking, serum cholesterol and blood pressure (Shekelle, Gale, & Norusis, 1985). These studies all demonstrate the routine absence of healthy and other appropriate comparison groups. Furthermore, these studies display the almost impossible task of separating cause and consequence of diseases. Is it the behavior pattern or the prognosis that leads to increased CHD risk? There is a need for clearer causal inferences between behavior patterns and disease endpoints. In order to allow for such inferences, it is necessary that future studies utilize appropriate comparison groups as well as continue to employ prospective studies.

Another issue of great concern involves the assessment techniques utilized to define the Type A construct. Given the various Type A measures used (see next section for details and examples) comparisons

of different studies is complex. This problem is made more difficult because the various measurements of Type A behavior show only modest overlap with one another and are psychometrically weak. The subsequent section will deal with these problems in more detail.

Assessment of Type A Behavior

Type A behavior assessment has been based on a number of instruments: Structured Interview (SI; Rosenman, 1978); Jenkins Activity Survey (JAS; Jenkins et al., 1974), Framingham Type A Scale (FTAS; Haynes et al., 1980), and the Bortner Rating Scale (BRS; Bortner, 1969). Of these measures only the SI, JAS, and the FTAS have been found to predict the development of CHD in a number of large prospective studies. Recently, a meta-analyses of a number of TABP studies has demonstrated that the Type A-CHD association emerges only when Type A is measured by the SI (Matthews, 1988).

Interview Method. The SI was developed in order to capture emotional overtones, psychomotor mannerisms, and vigorous voice stylistics considered as essential features of TABP (Rosenman, 1986). The format of the SI allows the interviewer to challenge the subject in order to evoke his/her expressive style as well as his/her verbal responses. A reanalysis of the WCGS (Matthews, Glass, Rosenman, & Bortner, 1977) has demonstrated that eight of the forty ratings of the SI discriminated CHD cases. These include potential for hostility, explosive voice modulation, vigorous answers, self-reports of frequent

anger, anger expressed out, irritation while waiting, competition with peers, and time urgency (Matthews et al., 1977). The SI measure has also been shown to be consistently related to physiological responsiveness in subjects (Contrada, Wright, & Glass, 1985; Houston, 1983; Holmes, 1983).

Although the SI is the preferred assessment technique of TABP, the cost, complexity and effort required to learn the proper use of the SI has caused many researchers to undertake the development of self-report questionnaires.

Self Reports. The most convenient and frequently used questionnaire has been the JAS. It contains 50 questions which were generated through discriminant function analysis of SI classification of subjects in the WCGS (Jenkins et al., 1971). Subscales of this measure comprise of job involvement, competitive drive and time pressure. Although some early success in relating JAS to CHD has been demonstrated (Jenkins et al., 1974; Kenigsberg, Zyzanski, Jenkins, Wandwell, & Licciaidells, 1974), more recent findings have raised doubts about its predictive power (Shekelle, Gale, et al., 1985; Cohen & Reed, 1985).

The FTAS contains 10 items which assess perceptions of job pressures, competitive drive and a sense of time urgency. It has been related to coronary mortality and morbidity in the eight year Framingham Study (Haynes et al., 1980).

The BRS is a set of 14 rating scales anchored by descriptors at the end of each scale. It has predicted the incidence of myocardial infarction, CHD, as well as sudden death in the FHS (Haynes et al., 1980).

Relationships Among Type A Behavior Measures. Although the aforementioned Type A behavior measures are characterized by high reliability coefficients, the correlations among them are less than impressive. The self-report measures (JAS, FTAS, & BRS) concur with the SI classification at 10-20 percent chance levels (Matthews & Haynes, 1986). Furthermore, even though these indices tend to measure common aspects of Type A behavior, they also appear to measure different ones (Matthews, 1982).

In addition to studies reported in Matthew's review (1982), more inconsistencies on the question of overlap have recently been noted in the literature. Musante, MacDougall, Dembroski, and Van Horn (1983) as well as Matthews et al., (1982) confirmed that SI classification overlapped little with the JAS or FTAS assessment in both men and women. Following sophisticated component analysis, the absence of verbal-behavioral stylistics in these measures were shown to account for the lack of overlap.

Assessing the Components of Type A Behavior. It is noteworthy that not all attributes contained in the conceptual definition of the multidimensional TABP are coronary-prone tendencies and some (e.g. job

involvement) may even confer protective effects (Dembroski, Weiss, Shields, Haynes, & Feinleib, 1978).

Following the lack of significant findings of a majority of studies of associations between TABP and CHD, regardless of the measure used (SI, JAS, FTAS, BRS), reconceptualization of the TABP concept has focused on the construct of hostility in the development of CHD (Chesney & Rosenman, 1985).

A growing body of evidence has recently prospectively and retrospectively implicated hostility in the pathogenesis of CHD (Barefoot, Dalhstrom, & Williams, 1983; Dembroski & Costa, 1987; Dembroski & Williams, 1989; Matthews & Haynes, 1986). For instance, hostility has been found to be related to the severity of coronary artery disease (William, Haney, Lee, Kong, Blumenthal, & Whalen, 1980) and the etiology of CHD (Barefoot et al., 1983; Shekelle, Gale, Ostfeld, & Paul, 1983). Further evidence also suggests the predictive validity of "potential for hostility" and "anger-in" for morbidity and mortality in heart disease (MacDougall, Dembroski, Dimsdale, & Hackett, 1985; Shekelle et al., 1983). Also, evidence of a strong association between CHD and hostility has been reported (Diamond, 1982; Friedman & Rosenman, 1974; Matthews et al., 1977; William et al., 1980). Finally, a meta-analyses of a number of recent population based studies demonstrated that hostility is a reliable predictor of CHD across all measures of hostility (Matthews, 1988). In summary, the literature supports a relationship between hostility and the development of CHD.

Problems with Assessment Techniques. The development of self-administered questionnaires were devised as a more economical and less complex estimate of coronary-prone behavior than the SI. Although some early success in relating these questionnaires' (i.e., Jenkins Activity Survey, Framingham Type A scale, Bortner Type A scale) scores to CHD have been reported, more recent studies have raised doubts about their predictive powers (see Matthews, 1988; Matthews & Haynes, 1986). The disadvantages of the self reported methods are likely due to the unwanted assessment of biases such as social desirability of Type A qualities, or social class and gender influences on reporting middle class, male stereotypic characteristics (Wright, 1988), or denial and other types of defensiveness. According to Rosenman (1978) "Type A individuals often have little insight into their pattern A behavior, and are often totally inaccurate to their responses to a written questionnaire". Wright (1988) suggests that many individuals are apologetic for being Type B and therefore, describe themselves as more Type A than they actually are. Type As on the other hand, may engage in strenuous denial of such characteristics. Consequently, self-reports are prone to response biases which compromise observed associations with behavioral, physiologic or CHD endpoints.

An additional problem with most measures is that emotional correlates of TABP, most notably, anger and hostility, are inadequately sampled (Dembroski & Costa, 1987; Matthews, 1982). For

example, the JAS inadequately measures the TABP characteristics of impatience, competitive drive, and potential for hostility that are captured by the SI and have been found to be particularly predictive of CHD incidence in the WCGS (Matthews, Glass, Rosenman, & Bortner, 1977). The Bortner scale may provide an assessment of various Type A behaviors, but it fails to measure the hostility component of Type A. Therefore it would seem that self-administered questionnaires are inadequate in assessing the coronary-prone behavior pattern, especially as it pertains to the hostility component.

This latter criticism also applies to the SI. Even though Dembroski et al., (1988) confirmed the hypothesis that SI defined Potential for Hostility is independently associated with increased risk for nonfatal myocardial infarction and coronary death among a reanalysis of MRFIT participants, a close look at the SI reveals only 5 questions for measuring anger-in vs anger-out. This state of affairs is surprising considering that the SI has recently been used to measure hostility. The SI is also susceptible to a number of biases, such as interviewer's speed of speech, nonverbal and verbal cues, the attitude of the interviewer and the inconsistent weighting of Type A components in classifying Type A individuals (Mavrogiannis, 1986). Another limitation of the SI is the short interview period used to assess the behavior pattern of the individual. The interviewer observes the subject for only 15 minutes in only one situation. This inadequate behavior sample makes it unrealistic to

expect the SI to provide an accurate estimate of the individual's responses in a variety of other situations.

The Quest For Valid Assessment Instruments. In light of the aforementioned psychometric problems and the increased interest in the hostility component of TABP, researchers have been interested in developing new instruments for assessing such subcomponent behaviors.

In an attempt to meet the need for a brief yet comprehensive multidimensional self-report measure of TABP that was psychometrically sound with existing measures, Mavrogiannis and Jackson (1987) constructed a new TABP measure called the Survey of Work Styles (SWS). Using a TABP construct approach to scale construction they developed the SWS measure consisting of six scales: Impatience, Anger, Work Involvement, Time Urgency, Job Dissatisfaction, and Competitiveness. The SWS has been found to be significantly related to both the JAS and the Framingham Type A scale with a median reliability of its scales being 0.815 and for the total scale, 0.90 (Mavrogiannis & Jackson, 1987). A discriminant function analysis yielded classification accuracy of 92.5 percent for Type As in relation to the Rosenman Structured Interview measure (Mavrogiannis & Jackson, 1987).

Peer Reviews. Recognizing the inherent difficulties in using adult Type A behavior assessment devices for children, Matthews and Angulo (1980) developed a children's assessment instrument, the Matthews Youth Test for Health (MYTH). The specific purpose of the

MYTH was to facilitate research regarding developmental aspects of Type A behavior characteristics and to generate research on prevention or therapeutic information at an early age. The MYTH was a 17-item scale which was developed to classify children as Type A or B by their teacher's ratings of seven Likert scale items measuring competitiveness, time urgency, and hostility in the classroom. It has been successfully employed by teachers in tapping a child's tendency to be competitive, impatient, and hostile (Yarnold & Bryant, 1988).

Wright (1988) found that when all these assessment techniques were compared (SI, self report, peer report), only the spouse report was able to identify the trait of controlled anger and denial. Spouse reports also demonstrated their superior ability to define anger-out. This suggests that the assessment by significant others may be a superior method of identifying the "active ingredients" (ie. anger expression and time urgency) in Type A individuals. Furthermore, considering that many Type A individuals lack insight into their own behavior (Rosenman, 1978) and their excessive concern with self-esteem enhancement and/or protection (Matthews, 1982; Strube, 1985), questionnaires rated by "significant others" (i.e., friends, family, etc.) may improve the predictability of physiological endpoints, especially if the "significant other" has known the subject for a period of time and observed him/her in a variety of settings. Research has successfully used naive observers to assess coronary prone behavior (Caffrey, 1968; Rosenman & Friedman, 1961).

Pathogenic Mechanisms Linking Type A Behavior with CHD

In spite of the association of TABP with CHD, the pathogenic mechanisms linking them are not well understood. However, many researchers have hypothesized that psychophysiological reactivity (i.e., cardiovascular and excessive neuroendocrine responsiveness) to psychological stress may be the mechanism involved in the etiology of CHD (Krantz & Manuck, 1984; Matthews & Haynes, 1986). This relationship among stress, reactivity, and CHD is rather complex. However, most researchers postulate that the contribution of psychological factors, such as Type A behavior and stress, to CHD is probably due to activity of the sympathetic adrenal-meduallary and pituitary adrenal-cortical systems (for a discussion of the validity of individual differences in sympathetic responsivity being pathogenic see Krantz and Manuck, 1984). Further, biological mechanisms have been identified through which the cardiovascular and endocrine correlates of sympathetic nervous system activity could promote the development of CHD. For example, emphasis has been focused on the role of the sympathetic nervous system hormones, the catecholamines, in promoting cardiovascular pathology (Ross & Glomset, 1976; Schneiderman, 1983).

Speculation about these mechanisms is encouraged by numerous studies that have demonstrated differences in blood pressure, heart rate, catecholamines, and cortisol between Type As and Type Bs when confronted by appropriately challenging or stressful situations (see

Wright, Contrada, & Glass, 1985). Evidence has indicated that Type A/B differences are most pronounced under certain stressful or challenging situations, and that psychological and cognitive interpretations often mediate physiological responses (Matthews, 1982; Wright et al., 1985). For example, events involving harassment as compared to competition, evoked more extreme physiological arousal solely among Type A subjects (Glass, Krakoff, Finkelman, Snow, Contrada, Kehoe, Mannucci, Isecke, Collins, Hilton, & Elting, 1980).

Of special interest to this study was the physiological change in platelet functioning during stress. Only recently have platelets been demonstrated as important in the genesis of cardiovascular diseases. These small anucleated blood cells circulate in blood vessels, sensoring vascular injury and coordinating necessary repairs. Both thromboxane and prostacyclin were two types of platelet aggregates of further interest to this study. Thromboxane is a potent inducer of platelet aggregation and constrictor of arteriol smooth muscle, whereas prostacyclin is a potent vasodilator and a potent inhibitor of platelet aggregates. Conditions of adverse stress contribute to enhanced levels of platelet responsiveness, which, in turn, together with other stress-associated physiological changes, may significantly contribute to cardiovascular disease (Gerrard & Peterson, 1985).

Increased circulatory platelet aggregates have been reported following emotional stressful events (Meist, Zehl, Sziegoleit, Taube, & Forster, 1982) and this has been most pronounced in individuals with

active resting angina (Serneri, Gensini, Masotti, Abbate, Poggesi, Laureano, Prisco, Rogasi, & Castellani, 1986). Exercise has also been associated with an increase in platelet count (Sarajas, 1976), particularly in coronary prone individuals (Mehta & Mehta, 1982). Gerrard, Dyck, and Dion (1989) found Type As to have a lower mean prostacyclin production level as compared to Type Bs following the mild stress imposed by the SI. Recently, Dion (1989) found significant thromboxane differences between physically unfit SI defined Type As as compared to fit Type As and all Type Bs at resting level. Following a stress-induced task (Stroop color naming task) SI defined Type As had significantly higher levels of heart rate and systolic blood pressure than all Type Bs (Dion, 1989).

Physiological Implications of Aerobic Exercise

A number of prospective studies have demonstrated an inverse relationship between physical activity and CHD risk rate. For instance, occupations requiring heavy energy expenditure (ie., 8500 kcal/week) have been associated with a lower risk of fatal myocardial infarction (Brand, Paffenbarger, Sholtz, & Kampert, 1979). Aerobic exercise has been associated with the increase of high density lipoprotein cholesterol (HDL) levels. These HDL levels, in turn, are associated with lower risk rates of CHD (Troxler & Schwertner, 1985). Exercise has also been shown to contribute to cardiac rehabilitation of patients with established CHD whereas lack thereof has been related to the development of CHD (Rigotti et al., 1983). Aerobic fitness has

also been associated with more rapid autonomic recovery from psychosocial stress, suggesting that fit individuals may be more effective in coping with emotional stress as compared to unfit individuals (Keller & Seraganian, 1984). In addition, preliminary work has shown thromboxane to be sensitive to acute exercise (Carter, Gerrard & Ready, 1988). Finally, the relationship between Type A behavior and increased levels of thromboxane was observed among unfit but not fit participants (Dion, 1989).

Given the unreliability of self-report questionnaires and the limited observation time and situation specificity of the SI, it would seem preferable that Type A assessment should be based on peer observations of the individual's Type A behavior. Previous research has successfully employed teachers (Matthews & Angulo, 1980; Yarnold & Bryant, 1988) as well as naive observers (Caffrey, 1968; Rosenman & Friedman, 1961) in identifying components of Type A behavior patterns in individuals. Accordingly, the present study proposed to modify the Survey of Work Styles (SWS; Mavrogiannis & Jackson, 1987) in order to permit the collection of peer ratings (i.e., the wording of the SWS was changed from the first to the third person). Given that the JAS suffers modest reliability, relatively poor classification rates and inadequate coverage of the multidimensional TABP (Byrne, Rosenman, Schiller, & Chesney, 1985; Matthews, 1982) and that the SWS yields a discriminant function analysis classification accuracy of 92.5 percent for Type As in relation to the SI (Mavrogiannis & Jackson, 1987), the

SWS measure was the scale of preference. The SWS was also chosen since it includes a measure of hostility, which is hypothesized by some investigators to be the 'toxic' component of Type A behavior.

The Present Study

The present study proposed to conduct a comparison of assessment methods, the validity of which was determined by the strength of the association with a physiological endpoint that was thought to be relevant to CHD risk, namely thromboxane and prostacyclin levels. More specifically, the present study attempts to determine the strength of association of each the three Type A behavior assessment indices (SI, self-report, peer-report) to a meaningful physiological endpoint (ie. the prediction of different levels of circulating platelet aggregates as well as heart rate and systolic blood pressure). Each subject was assessed by each of the three assessment indices as well as their level of physical fitness (ie., aerobic fitness as determined by their volume of oxygen intake). Physical fitness was included due to research findings suggesting its effect on thromboxane A2 and cardiovascular reactivity. Also, physical fitness has been hypothesized to enhance individuals' coping style with stress.

The independent variables in this study were Type A and Type B behavior patterns as determined by each of the three assessment indices, the subject's level of fitness according to his response on

the fitness test (see or Dion, 1989 for more details), and hostility as measured by the HO scale (Cook & Medley, 1954). The dependent variables included the differences of circulating platelet aggregates (thromboxane & prostacyclin) as well as heart rate and systolic blood pressure taken before and after a stroop task.

An important aspect of this study includes the relationship among the three types of assessment indices. It was postulated that a stronger relationship would exist between the SI and the peer report as compared to each of these measures associated with the self report. It was also predicted that a agreement between self and peer report would be weaker among SI defined Type As than among SI Type Bs. This was in accordance with previous findings which suggest that Type A individuals are not accurate at self-descriptions (Matthews & Haynes, 1986).

The relationships of these three measures was also related to physiological endpoints. According to previous findings (Dion, 1989), it was predicted that as a group, unfit Type A subjects would demonstrate a significantly higher production of circulating platelet aggregates than fit Type As and all Type Bs. These findings were predicted to be strongest among first the peer defined Type As, then the SI defined Type As, and least among the self report defined Type As. Furthermore, SI defined Type As as well as peer defined Type As, should demonstrate significantly higher levels of heart rate and systolic blood pressure as compared to Type Bs following a stressor

(Dion, 1989). Finally, it was predicted that hostility would affect circulating platelet aggregates both in isolation and in combination with TABP. It was predicted that hostile Type As overall, would have greater platelet aggregate circulation as compared to nonhostile Type As and all Type Bs.

In summary, the present study was an attempt to refine the measurements of Type A behavior by relating such measures to a physiological endpoint both prior and following the induction of a stressful experience. In addition, the effects of fitness and hostility levels on blood metabolites and cardiovascular endpoints were also assessed.

Method

Subjects

Sixty-six male introductory psychology students whose first language was English were used as subjects in the experiment. The subjects had been selected from a larger pool of 500 students based on their response to the Physical Fitness questionnaire (see Dion, 1989). They had also completed a stress-induced experiment where blood samples were taken prior to and following the Stroop Color Word task (see Dion, 1989 for more details).

Of the 66 subjects, the SI classified 38 as Type A and 28 as Type B. A median split of the Survey of Work Styles (SWS; Mavrogiannis & Jackson, 1987) yielded 33 Type As (M=302.58; SD=14.84) and 33 Type Bs

(M=256.79; SD=23.41) whereas the median split of the Peer-Report defined 32 Type As (M=295.75; SD=22.98) and 34 Type Bs (M=246.27; SD=19.72). The mean of the 66 subjects overall SWS score was 279.68 (SD=30.18), whereas the Peer-Report (SWS third person) overall score mean was 270.26 (SD=32.72). A comparison of the present study's SWS and Peer-Report SWS scores are in close approximation with both the larger population of 500 subjects 281.86 (SD=27.65) and Mavrogiannis and Jackson's (1989) mean of 277.04 (SD=30.10).

Classification of fit and unfit individuals was accomplished by employing the standard cutoff (unfit < VO2max 47.0 < fit; for further details see section on VO2max or Dion, 1989). Thirty-six subjects were identified as fit (M=54.66; SD=3.84) and 28 as unfit (M=43.52; SD=2.80). Finally a median split was employed on the Cook-Medley Hostility scale resulting in 31 self-defined high hostile individuals (M=31.23; SD=5.00) and 35 self-defined low hostile individuals (M=19.83; SD=4.45).

Male subjects were used in this study to reduce variability and because most recent positive findings on A/B differences in aggression have been based on males (Holmes, McGilley, & Houston, 1984; Holmes & Will, 1985). Also, Hastrup and Light (1984) have demonstrated differences in cardiovascular responses to stress between women and men. These differences have been purported as a function of the menstrual cycle, specifically the change in the level of the estrogen hormone (Hastrup & Light, 1984).

Measures

Classification of subjects as Type A or Type B was based on the Structured Interview and self-report and peer-reports of the Survey of Work Styles questionnaire.

Structured Interview (SI; Rosenman, 1974). The SI consists of a structured set of questions asked in a provocative style by the interviewer and was scored by rating emotional overtones, exaggerated psychomotor mannerisms, and vigorous voice stylistics (Rosenman, 1986); the essentials of Type A behavior not assessed by paper-pencil measures. According to Friedman and associates (1969), "assessment of the behavior-pattern actually was determined far more by the stylistics in which the interviewee responds than by the content of his/her responses" (p.829). In addition, the SI is the only prospectively valid assessment device currently available in that it has been related to future heart disease (Yarnold & Bryant, 1988). The SI consists of 22 questions with hostile, competitive and time urgent themes. Scoring was based on both the form of responding as well as the content of responses. Each interview was taped. All tapes were subsequently rated by a trained individual and a subset of these were also rated by an independent rater to insure reliability. The scoring system, developed by Rosenman (1974), was used to make behavioral classifications (see Appendix A).

Survey of Work Styles (SWS; Mavrogiannis and Jackson, 1987). The SWS was developed using a TABP construct approach to scale construction and consists of six scales, Impatience, Anger, Work Involvement, Time Urgency, Job Dissatisfaction, and Competitiveness. It has been found to be significantly related to both the JAS and the Framingham Type A scale with a median reliability of its scales being 0.815 and for the total scale, 0.90 (Mavrogiannis & Jackson, 1987). A discriminant function analysis yielded classification accuracy of 92.5 percent for Type As in relation to the Rosenman Structured Interview measure (Mavrogiannis & Jackson, 1987) (see Appendix B).

Peer-Review The Peer-Review assessment index was constructed by modifying the SWS to the third person form (see Appendix C).

The Cook-Medley Hostility (Ho) scale (1954) was developed from the Minnesota Multiphasic Personality Inventory. The scale primarily assesses suspiciousness, resentment, frequent anger, and cynical distrust of others. High scores are related with an unhealthy psychosocial risk profile. Subjects with high scores tend to be more angry, show less hardiness, display more frequent and severe hassles, and have fewer or less satisfactory social supports (Smith & Frohm, 1985). According to one cross-sectional study, the scores on the Ho have been related to the severity of coronary artery disease while two prospective studies have found the Ho to predict the onset of CHD (Smith & Frohm, 1985). Finally, the Ho scale has demonstrated convergent and discriminant validity (Smith & Frohm, 1985) (see Appendix D).

VO2max Scale. Maximal oxygen uptake was measured via graded treadmill test until exhaustion. A Quinton Q65 treadmill was used. The treadmill was programmed to remain at a constant speed of 7 m.p.h. while increasing grade by 2% every 2 min with initial grade set at 0%. Heart rate was continuously monitored using a Cambridge VS4 electrocardiograph. A Beckman gas analyzer (MMC Horizons System, Model Sensormedics) was used in order to determine the subject's maximal oxygen uptake (VO2max). VO2max is expressed in ml of oxygen per Kg of body weight per min. In other words, it is the total amount of oxygen consumption by an individual's entire body (ie. lungs, blood etc.) Fitness testing was conducted by qualified technicians at the Sport and Exercise Science Research Institute at the University of Manitoba (see Dion, 1989 for more details).

Procedure

The final sample of 100 male introductory psychology students were selected from a group of 700 subjects based on their self-report level of physical activity (Lifestyles Questionnaire). Subjects were asked to participate in a research project investigating the relationship between fitness and personality traits (the format of the procedure is outlined in Appendix E). The experiment consisted of 2 sessions, taking place several months apart. Except for the completion of the SWS and the HO, which were completed in group sessions several weeks prior to the experiment, subjects went through the entire procedure on an individual basis.

During the first session, subjects' fitness level was assessed according to the VO2max measurement.

The following week, baseline measures of HR, DBP, SBP, thromboxane, and prostacyclin were taken. Subjects than underwent the SI which was used to classify behavior type. After a 5 min rest period, they were then individually exposed to the psychosocial stressor (ie. Stroop color-word test). Measures of HR, DBP, SBP, were recorded at 1 min intervals during both the test and during the 4 min recovery period following the test. Measurement of the metabolites of thromboxane and prostacyclin were taken immediately after the stressor. The measures taken during the stressor were indicative of the level of reactivity, while the measures taken after provided information on the recovery of the subjects.

Approximately three months after the initial experiment was conducted by Dion (1989), subjects were contacted by telephone and asked to nominate peers for a short follow up study. They were asked to nominate three peers. Subjects were also asked to rate how well they knew each of the peers on a 9 point scale (see Appendix F). Assurance was given that peers would not be advised of one's self-ratings. The criteria for designating peers were that they should (a) have known the subject for at least one year, (b) have observed them in several situations, and (c) were not members of their immediate family (see Appendix C).

The first nominated peer was selected and asked to come to the laboratory to complete the Peer-Report version of the SWS (reworded in the third person). If that peer refused participation, the next nominated peer was contacted. Finally, if that peer refused to participate, the third nominated peer was approached. Peers were asked not to discuss their assessments with the subjects until they had returned the completed forms. Upon completion, subjects received $5 for their nomination and the peers were each given $10 for their participation.

Results

Correspondance of Behavioral Assessment Techniques

Agreement levels were determined by the percentage of subjects classified similar by two of the assessment indices. Table 1 displays

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Place Table 1 here

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the percentage of agreement of classification between the three assessment techniques. In addition, overall classification agreement between assessment indices was also reported in Table 1. Agreement levels with the peer report method were at chance levels, while the agreement between the SI and the SWS was modestly higher, it is not significantly higher than chance (kappa = .4986).

Table 1

Percentage of Agreement Between Type A Measures

		Assessment Techniques					
		SWS			Peer Report		
Behavior Type		Type A	Type B	Overall	Type A	Type B	Overall
SI	Type A	60.5%	-	-	50.0%	-	-
	Type B		64.3%	-	-	53.6%	-
	Overall	-	-	62.4%	-	-	51.8%
SWS	Type A	-	-	-	50.0%	-	-
	Type B					47.1%	-
	Overall	-	-	-	-	-	48.6%

Note: SI = Structured Interview;
SWS = Survey of Work Styles.
Overall = Total Agreement including both Type A and Type B agreement.

The types of analyses of variance (ANOVAs) employed are described in the sections in which they were used. Where appropriate, specific pairwise comparisons were made using Scheffe's procedure. Alpha was set at .05 for all comparisons.

Blood Platelet Aggregate Measures

Three, 2 (Behavior Type) X 2 (Physical Fitness) X 2 (Hostility Level) ANOVAs using each of the assessment indices were conducted on bleeding time thromboxane and prostacyclin metabolites before and after the stressful color naming task. The results associated with each measure of Type A behavior are presented sequentially.

Thromboxane

SI. An ANOVA on thromboxane production yielded a significant interaction between Behavior Type and Fitness $F(1,57) = 4.21$ $p<.05$. A breakdown of the interaction indicated that unfit Type As had a greater level of circulating TXB (M=4.6) than did unfit Type Bs (M=2.4) before the stressor (see Table 2). No SI effects were seen

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Place Table 2 here

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following the stressor.

Table 2

Effects of Behavior Type Measures and Fitness Level on Mean Bleeding Time Thromboxane B2 (ng/ml) Before and After Stressor

Measure	SI				SWS				Peer Report			
Behavior Type	Type A		Type B		Type A		Type B		Type A		Type B	
Fitness Level	U	F	U	F	U	F	U	F	U	F	U	F
Pre Stressor	4.6	3.4	2.4	3.7	4.1	3.6	3.1	3.4	3.8	3.4	3.3	3.6
Post Stressor	3.4	4.7	2.9	3.3	3.5	5.0	2.9	3.2	3.0	4.3	3.4	4.1

*

Measure	SI		SWS		Peer Report	
Behavior Type	Type A	Type B	Type A	Type B	Type A	Type B
Pre Stressor	3.9	3.0	3.8	3.3	3.6	3.5
Post Stressor	4.2	3.1	4.4	3.1	3.7	3.8

*

Note: SI= Structured Interview; SWS = Survey of Work Styles; U = Unfit; F = Fit; * = $p<.05$.

SWS. Although no effects were observed before the stressor, a significant main effect for Behavior Type on TXB was observed following the stressor $F(1,57)=5.05$ $p<.05$. Thus, SWS-defined Type As had higher levels of TXB (M=4.4) following stress then did Type Bs (M=3.1).

Peer-Report. No significant effects on TXB were found with Peer-Report Behavior Type.

Summary.

Differences in bleeding TXB were observed before the stressor in fit and unfit SI-defined Type As. The SWS did not result in A/B differences before the stressor, but such TXB effects were seen following the stressor. The peer method did not produce any A/B differences on TXB. Finally, the hostility variable was not associated with group differences in thromboxane metabolite levels.

Prostacyclin

SI. No significant main effects on prostacyclin production (PGI), measured as the primary metabolite, 6-keto-PGF, were observed. However, a significant interaction was found between Behavior Type (SI) and Physical Fitness $F(1,57)=4.58$, $p<.05$ after the stressor. This interaction indicated that following stress, unfit Type As had higher levels of prostacyclin (M=2.6) as compared to unfit Type Bs (M=1.3) (see Table 3).

SWS and Peer-report. No significant effects on PGI were found with either the SWS or the Peer-report behavior type measures.

Place Table 3 here

Summary.

Increased production of PGI was associated with the SI-defined Type A behavior measure in that unfit Type As had higher levels of prostacyclin metabolite than unfit Type Bs.

Cardiovascular Measures

Heart Rate (HR). Three 2(Behavior Type) X 2(Physical Fitness) X 3(Time: Resting, During Stress, Recovery) ANOVAs using each of the behavioral assessment indices were conducted on HR. This analysis revealed a main effect for both physical fitness $F(1,186)=10.78$ $p<.005$ as well as Time $F(1,186)=40.01$ $p<.0001$. These findings indicate that fit individuals have a lower overall HR (M=72.2) than unfit individuals (M=77.4). Significant fitness effects were also observed at baseline [$F(1,186)= 10.89, p<.005$], during stress [$F(1,186)=15.08, p<.001$] and following stress [$F(1,186)=7.30, p<.01$) (see Table 4a for means). Furthermore, the stress manipulation had a significant effect on subjects' HR (M=84.3) as compared to either resting level (M=68.6) or recovery (M=70.7) (see Table 4d).

Table 3

Effects of Behavior Type Measures and Fitness Level on Mean Bleeding Time 6-Keto PGF (pg/min) Before and After Stressor

Measure	SI				SWS				Peer Report			
Behavior Type	Type A		Type B		Type A		Type B		Type A		Type B	
Fitness Level	U	F	U	F	U	F	U	F	U	F	U	F
Pre Stressor	2.7	1.8	1.1	2.0	1.7	1.6	2.1	2.2	1.6	2.7	2.3	1.2
Post Stressor	2.6	1.7	1.3	2.5	1.8	2.2	2.1	1.8	1.9	2.2	2.0	1.8

* (1.7 vs. 1.3)

Measure	SI		SWS		Peer Report	
Behavior Type	Type A	Type B	Type A	Type B	Type A	Type B
Pre Stressor	2.2	1.5	1.6	2.1	2.1	1.7
Post Stressor	2.1	1.9	2.0	1.9	2.1	1.9

Note: SI= Structured Interview; SWS = Survey of Work Styles;
U = Unfit; F = Fit; * = $p<.05$.

Finally, three 2(Behavior Type) X 2(Hostility Level) X 3(Time: Resting, During Stress, Recovery) ANOVAs using each of the behavioral assessment indices did not yield any significant main effects or interactions.

SI. A significant interaction between Behavior Type and Physical Fitness was observed across all levels of HR $F(1,186)=5.66$ $p<.05$. This interaction indicated that as with TXB levels, HR was higher among unfit Type As (M=80.5) as compared to fit Type As (M=71.8), fit Type Bs (M=72.9), or unfit Type Bs (M=74.3) (see Table 4d). Furthermore, fit Type As had ~~higher~~ lower HR at baseline than unfit Type As [$F(1,186)=11.69, p<.001$ and unfit Type As demonstrated higher HR than either fit As or fit Bs [$F(1,186)= 7.30, p.01$] (see Table 4a for means of above findings). A 2(Behavior Type) X 2(Hostility Level) X 3(Time: Resting, During Stress, Recovery) ANOVA did not yield any significant findings.

Place Tables 4a, 4b, 4c, 4d here

SWS. An interaction was observed between Behavior Type as defined by the SWS and Physical Fitness across all levels of HR [$F(1,186)=9.98$ $p<.005$], with unfit Type Bs exhibiting overall HR levels higher (M=79.9) than either fit Type As (M=74.1) or fit Type Bs

Table 4a

Effects of Behavior Type Measures and Fitness Level on Mean Heart Rate Before, During and After Stress

Measure	SI				SWS				Peer-Report			
Behavior Type	Type A		Type B		Type A		Type B		Type A		Type B	
Heart Rate												
Before	68.4		68.9		67.9		69.4		69.3		74.2	
During	85.4		83.0		83.4		85.5		84.5		67.9	
After	71.9		69.0		70.4		70.9		70.9		84.2	
Fitness Level	U	F	U	F	U	F	U	F	U	F	U	F
Heart Rate	*						*					
Before	74	65	69	69	68	68	74	65	72	67	71	66
During	90	82	85	81	83	84	91	79	86	83	89	80
			*				*					
After	77	68	69	68	71	70	75	67	73	69	73	68

(Table 4a continued)

Fitness Level	Unfit Individuals		Fit Individuals
Heart Rate			
Before	71	*	66
During	88	*	82
After	73	*	69

Note: SI= Structured Interview; SWS = Survey of Work Styles;
U = Unfit; F = Fit; * = $p<.05$.

Table 4b

Effects of Behavior Type Measures and Fitness Level on Mean SBP Before, During and After Stress

Measure	SI				SWS				Peer-Report			
Behavior Type	Type A		Type B		Type A		Type B		Type A		Type B	
SBP												
Before	126		132		127		131		131		127	
During	138		138		138		137		140		136	
After	126		126		126		126		126		126	
Fitness Level	U	F	U	F	U	F	U	F	U	F	U	F
SBP												
Before	128	126	133	131	127	128	133	129	133	129	127	127
During	140	136	142	134	140	137	142	132	143	136	139	134
After	127	125	130	121	128	124	130	123	128	124	130	123

(Table 4b continued)

Fitness Level	Unfit Individuals		Fit Individuals
SBP			
Before	130		128
During	141	*	135
After	129	*	123

Note: SI= Structured Interview; SWS = Survey of Work Styles;

U = Unfit; F = Fit; * = $p<.05$.

Table 4c

Effects of Behavior Type Measures and Fitness Level on Mean DBP Before, During and After the Stressor

Measure	SI				SWS				Peer-Report			
Behavior Type	Type A		Type B		Type A		Type B		Type A		Type B	
DBP												
Before	66		64		64		66		65		65	
During	75		74		75		74		74		74	
After	63		65		63		64		64		64	
Fitness Level	U	F	U	F	U	F	U	F	U	F	U	F
DBP												
Before	68	64	65	63	66	63	68	63	67	63	67	63
During	76	74	77	71	77	73	75	73	76	73	77	73
After	65	61	68	61	67	60	66	63	66	61	67	61

(Table 4c continued)

Fitness Level	Unfit Individuals		Fit Individuals
DBP			
Before	67	*	63
During	76	*	73
After	67	*	61

Note: SI= Structured Interview; SWS = Survey of Work Styles;
U = Unfit; F = Fit; * = $p<.05$.

Table 4d

Effects of Behavior Type Measures and Fitness Level on Overall Mean HR, DBP and SBP

Measure	SI				SWS				Peer-Report			
Behavior Type	Type A		Type B		Type A		Type B		Type A		Type B	
Fitness Level	U	F	U	F	U	F	U	F	U	F	U	F
HR	81	72*	74	73	75	74	80*	71	77	74	78	72
DBP	71	67	71	66	71	66	71	67	70	67	72	66
SBP	132	128	134	127	132	129	134	127	134	129	132	127

Fitness Level	Unfit Individuals		Fit Individuals
HR	77.38	*	72.18
DBP	69.89	*	65.81
SBP	133.48	*	128.88

Note: SI= Structured Interview; SWS = Survey of Work Styles; U = Unfit; F = Fit; HR = Heart Rate; DBP = Diastolic Blood Pressure; SBP = Systolic Blood Pressure; * = $p<.05$.

(M=70.8) (see Table 4d). Significant interations were also observed between fitness and behavior type. For instance, fit Bs had significant lower HR than unfit Bs at baseline [$F(1,186)=7.91, p<.01$] and after the stressor [$F(1,186)=6.25, p<.05$)]. During stress, unfit Type Bs had significantly higher HR as compared to fit Bs, and all Type As (see Table 4a for means). A 2(Behavior Type) X 2(Hostility) X 3(Time: Basal, Stressor, Recovery) yielded a significant interaction $F(1,186)=8.02$ $p<.01$ indicating that low hostile Type Bs have higher levels of HR (M=76.9) than low hostile Type As (M=71.5) (see Table 5).

Place Table 5 here

Peer-Report. The ANOVA using the Peer-Report measure of Type A yielded no effects on HR.

Summary.

Both SI and the SWS resulted in A/B by fitness interactions at baseline and during and following stress. Furthermore, the interaction between hostility and SWS was instrumental in predicting HR among SWS-defined

Table 5

Effects of Behavior Type Measures and Hostility Level on Overall Mean HR, DBP and SBP

Measure	SI				SWS				Peer-Report			
Behavior Type	Type A		Type B		Type A		Type B		Type A		Type B	
Hostility	H	L	H	L	H	L	H	L	H	L	H	L
HR	75	74	76	74	76	73	72	77	74	74	76	74
SBP	128	130	132	133	127	132	136	131	131	127	134	133
DBP	68	68	68	67	67	69	68	68	68	68	68	68

* (HR: 72 vs 77)

Hostility	High Hostile Individuals		Low Hostile Individuals
HR	74.9		74.2
DBP	67.7		67.6
SBP	128.7	*	133.0

Note: SI= Structured Interview; SWS = Survey of Work Styles; H = High Hostile; L = Low Hostile; * = Significant effect; HR = Heart Rate; DBP = Diastolic Blood Pressure; SBP = Systolic Blood Pressure; * = $p<.05$.

subjects such that high hostile SWS-defined Type Bs had higher HR than low hostile Type As.

Systolic Blood Pressure (SBP). Three 2(Behavior Type) X 2(Physical Fitness) X 3(Time: Resting, During Stress, Recovery) ANOVAs conducted on each of the three behavioral indices demonstrated a main effect for both Physical Fitness $F(1,186)=5.70$ $p<.05$ and Time $F(1,186)=13.75$ $p<.0001$. Fit individuals demonstrated significantly lower overall SBP (M=128.9) than unfit individuals (M=133.5) (see Table 4b). Stress manipulation successfully increased the level of SBP (M=137.9) as compared to baseline (M=129.06) and recovery (M=125.94). Furthermore, a 2(Behavior Type) X 2(Hostile Level) X 3(Time: Resting, During Stress, Recovery) ANOVA yielded a hostility main effect on SBP, $F(1,186)=13.54$ $p<.0001$. This finding indicated that high hostile individuals have lower SBP (M=128.7) than low hostile individuals (M=133.0).

SI, SWS, Peer-Report. No effects were found for any of the three behavioral assessment techniques on SBP.

Diastolic Blood Pressure (DBP). Three 2(Behavior Type) X 2(Physical Fitness) X 3(Time: Resting level, During stress, Recovery) ANOVAs conducted on each of the behavioral indices yielded a main effect for both Physical Fitness $F(1,186)=12.98$ $p<.0005$ and Time $F(1,186)=31.38$ $p<.0001$. These findings indicated that fit individuals had lower DBP (M=65.8) as compared to unfit individuals (M=69.9) and

that the stressor increased DBP (M=74.4) as compared to either resting (M=64.9) or recovery (M=63.7) levels. A 2(Behavior Type) X 2(Hostility Level) X 3 (Time) ANOVA yielded no significant results using any of the three behavioral indices (see Table 4c).

SI, SWS, Peer-Report. No A/B main effects or interactions were found for any of the three behavioral assessment techniques on DBP during any of the three measurement periods.

Summary.

The results on the cardiovascular measures generally indicate that only HR was sensitive to A/B differences. Such differences were qualified by fitness level and hostility level. The SI identified unfit As as having the highest HR while the SWS indicated that Type Bs and low hostile Type Bs as having the highest HRs. In contrast to the weak effects of Type A behavior on cardiovascular responses, fit subjects uniformly had lower HR, DBP, SBP, whereas high hostile individuals had lower SBP, and stress increased cardiovascular reactivity.

Discussion

The present study was concerned with the comparison of Type A behavior assessment techniques, with special emphasis on: (a) the agreement between assessment techniques; (b) the strength of association with each physiological endpoint relevant to prediction of

CHD; and, (c) the frequency of predictability of physiological endpoints by each behavioral measure. Furthermore, hostility, the "toxic" component of CHD, was also investigated in its relationship to physiological reactivity.

Correspondence Between Assessment Techniques

In general, low levels of agreement were observed between the different methods of behavior type classification. The SI demonstrated an IRR of 90% in the initial sample (Dion, 1989). Although an agreement was seen between the SI and the SWS relative to other comparisons, the correspondance between these measures was not significantly greater than chance. This is surprising considering that Mavrogiannis and Jackson (1987) demonstrated a discrimination analysis of classification accuracy of 92.5% for the correspondance of SI to SWS. A number of factors may account for the low agreement among each of the behavior measures.

For instance, categorization of behavior type on both the continuous scales, SWS and Peer-Report, was determined by a median split on the 66 subjects, whereas the dichotomous scale, SI, allowed for only one of two classifications (Type A or Type B), and resulted in unequal cell sizes (ie. 38 Type As; 28 Type Bs). It is clear, therefore, that different constraints on the categorization by SI and the other two measures limited agreement levels.

Considering that the notion of challenge is important in identifying Type A behavior characteristics (Rosenman, 1986), the lack thereof in both the SWS and the Peer-Report may have reduced agreement between the behavior measures. The validation of Type A behavior self-reports may be increased by introducing challenge or frustration prior to administering the SWS or the Peer-Report. Furthermore, the presumed unreliability of self-reports by Type As (Rosenman, 1978), due to their excessive concern with self-esteem enhancement (Matthews, 1982; Strube, 1985), and defenses such as denial (Rosenman, 1978) has been emphasized by researchers.

Given that recent researchers have demonstrated the strength of reports by significant others (Matthews & Angulo, 1980; Yarnold & Bryant, 1988), the low level of agreement between the SI and the Peer-Reports was unexpected. The delayed administration of the Peer-Report may have accounted for the lack of agreement as well as its poor performance. For instance, the SWS was administered several weeks prior to the SI, whereas the Peer-Report was administered four months following the SI. Given that the TABP is not a trait but rather a set of predispositions, this difference in time, may have resulted in the change of the subjects' behavior characteristics, and therefore, weakened the agreement between the two behavior measures.

Furthermore, the narrow selection criteria for the nomination of peers may have accounted for the lack of correspondance between the SI and the Peer-Report. The criteria did not allow for either immediate

family members or spouses; individuals who would perhaps have had more information about the subject. Recent research has demonstrated the potential of using these two groups as raters (Wright, 1988).

Frequency of Physiological Predictability by Measures of Behavior Type

Only two, the SI and SWS behavioral indices, yielded significant relationships with physiological endpoints. Neither was clearly superior in producing A/B differences on the physiological endpoints. However, the SI tended to be the most effective in the prediction of both metabolites TXB and 6 keto PGF.

Given the low correspondance between SI and the SWS, it is remarkable that the SWS demonstrated predictive power in the level of bleeding time of the TXB metabolite. This may indicate that although these two measures assess somewhat different behavioral patterns, they nonetheless predicted similiar metabolite endpoints, but at different times (ie., SI at baseline and the SWS following stress). However, the prediction of HR was not the same between these two indices. The SI predicted unfit As as having higher HRs as compared to fit As and unfit Bs, whereas the SWS predicted unfit Bs as having higher HRs vs fit As or fit Bs. These differences in findings may be accounted for by the different times that each assessment technique was administered. The proximity of the SI to the physiological measures may therefore, have increased this measure's effectiveness in predicting the endpoints.

Overall, the SI and the SWS were equally effective in predicting physiological endpoints - namely, TXB, and more effective than the Peer-Report. However, no statistical parameter was available to directly compare the predictive strength of the SI to other behavioral measures. This was due to the dichotomous nature of the SI which did not lend itself comparable to the continuous scales SWS or Peer-report. A possible solution would be to modify the SI into a continuous scale and thereby allow direct comparisons to other behavioral scales.

With respect to PGI, there was the surprising finding that unfit SI-defined Type As have higher levels of prostacyclin than unfit Bs. This finding is not consistent with current literature which theorizes that fit individuals should have higher levels of prostacyclin than unfit individuals (Gerrard et al., 1988).

Predictability of Physiological Endpoints

As previously mentioned, each of the behavioral assessment techniques yielded significant relationships with certain physiological endpoints. The analyses have important implications for theories of Type A behavior, physical fitness and hostility.

Blood Platelet Aggregates. Using a subsample from Dion (1989), the present study replicated the previously observed interaction effect of TABP and physical fitness on the production of TXB. In general, the results demonstrated that prior to stress, unfit Type As

had a higher production of TXB than unfit Type Bs and that following stress, Type As in general, have higher levels of TXB than do Type Bs. These observations suggest that: (a) stress among Type As increases circulating blood metabolite TXB (Meist et al., 1982); (b) such differences (ie. TXB) are also present at baseline (Dion, 1989); and, (c) physical fitness may provide a protective effect against the adverse effects of abnormal levels of TXB associated with Type A's coping style to stress (Dion, 1989).

The PGI observation with unfit SI-defined Type As was unexpected and is inconsistent with a recent study which found that following the mild stress of the SI, Type As had lower levels of 6-keto than did Type Bs (Gerrard, Dyck, & Dion, 1988). Since prostacyclin is a protective factor against CHD, the results of the present study are not only at variance with previous data but also with the hypothesis that Type A behavior is associated with CHD. Because of the various inconsistancies, including the lack of support for the hypothesis that unfit Type As should have higher levels of 6-keto PGF, this data should be seen as tentative.

Although the hostility component is the most intensely studied aspect of TABP, (Dembroski & Costa, 1987; MacDougall et al., 1985), the present study did not support the hypothesis that high hostile Type As overall would have higher levels of TXB than would either low hostile Type As or high hostile Type Bs. The lack of support may be due to the absence of provocation during the administration of the SWS

and the Peer-Report behavioral indices. Administration of provocation has resulted in differences in hostile responses among Type A/B individuals (Schonwetter & Janisse, 1989) and has been used in the SI to generate overt Type A behavior characteristics (Rosenman, 1986).

Furthermore, the relatively small sample size and the number of different levels of the independent variables (ie. 2(Behavior Type) X 2(Physical Fitness Level) X 2(Hostility Level)) may also be responsible for the lack of support. Further research should concentrate on various hostility measures and their predictive strength on metabolite TXB.

Cardiovascular Responses. The observation of increased cardiovascular activity among unfit individuals in the present study further supports the previous findings (Hull, Young, & Ziegler, 1984; Blumnethal, Lane, Williams, McKee, Haney, & White, 1983) regarding the protective effects of physical fitness (ie. fit subjects had lower HR & BP than unfit subjects). In addition, unfit Type As had higher HR than did fit Type As or all Type Bs. Other studies have demonstrated higher levels of HR as well as DBP and SBP following stress in unfit Type As (Wright et al., 1985) and all Type As (Lake, Suarez, Schneiderman, & Tocci, 1985).

The finding that high hostile individuals had lower SBP than low hostile individuals was surprising. Although statistically significant, it goes against the hypothesis that hostility predisposes

individuals to CHD. Factors responsible for this unique finding may include sampling biases. One third of the subjects contacted declined participation in the present study and of these 30 individuals, a large number were rather hostile in response to the telephone solicitor. It is therefore possible, that the results reflect the absence of these hostile individuals. Furthermore, the Cook-Medley Hostility scale may not have measured the components of hostility that predict cardiovascular reactivity. Further research should utilize other measures of hostility or anger in relationship with cardiovascular reactivity.

The present study also supports Keller and Seraganian's (1984) hypothesis that aerobically fit individuals may be more effective in coping with emotional stress as compared to unfit individuals. Aerobic fitness tends to decrease the physiological and cardiovascular reactivity to stress. Given that Type As respond to challenge or stressful situations with increased cardiovascular reactivity (Contrada, Wright, & Glass, 1985) and that these responses have been hypothesized in the etiology of CHD (Wright et al., 1985), physical fitness (ie. aerobic exercise) may alleviate Type As predisposition to high risk status of CHD. For example, Rigotti and colleagues (1983) have demonstrated that aerobic exercise training programs contribute to cardiac rehabilitation of patients with established CHD. Furthermore, Light and colleagues (1987) hypothesized that aerobic exercise may decrease beta-adrenergic myocardial responses to physical

and behavioral challenges and thereby reduce CHD risk (for more details see Lake et al., 1987).

In conclusion, unfit Type As have demonstrated higher levels of cardiovascular responding to stress as compared to fit Type As. This coping style to stress may have adversive effects on these individuals, predisposing them to higher risks of CHD, whereas fit Type As coping style may ensure a protective effect against CHD.

Summary

Type A behavior is a pattern of intense behavioral activation that is the product of a person-by-environment interaction. This intense and substantial behavioral activation is generated by challenging or other threatening situations involving stress. For instance, this study as well as other studies, have demonstrated that Type As and unfit Type As respond to laboratory challenges with exaggerated imbalances of TXB (Dion, 1989) and sympathetically mediated cardiovascular responses (Dembroski, MacDougall, & Shields, 1977; Manuck, Craft, & Gold, 1978; Manuck & Garland, 1979). This exaggerated reactivity to stress has been hypothesized to increase the individuals's risk to CHD. However, it has been postulated that the adverse effects of coping with stress may be reduced through aerobic exercise (Rigotti et al., 1983). Furthermore, the reduction of stress may also be attributed to a decrease in CHD risk. As demonstrated in the present study, aerobically fit Type As displayed lower physiological reactivity to stress than did unfit Type As.

Future attempts will produce findings that indicate what aspects of aerobic fitness and hostility complex that are the most relevant, thus leading to more specific and sensitive descriptions of the coronary-prone behavior pattern.

The disordered balance of TXB in the present study and other recent studies has been implicated in the genesis of cardiovascular disease (Gerrard & Peterson, 1985). Furthermore, the response to either physical or emotional stressors has been influential in the imbalance of TXB (Levine, Towel, Suarez, et al., 1985; Mehta, Mehta, & Horalek, 1983; Neri, Serneri, et al., 1986). Although the role of TXB is not well understood, the present study demonstrated that an interaction between physical fitness and behavior pattern as well as a main effect of behavior type were instrumental in predicting an imbalance in TXB and HR following a stressor. Evidence tends to suggest that TXB imbalance may influence cardiovascular disease. Therefore, future research should investigate the relationship between TXB imbalance and CHD.

With regard to the measurement of TABP, the traditional approach seems to be the SI. As a result, researchers have limited themselves to the search for aspects of coronary-prone behavior that can be derived from the SI. The present study employed the latter along with the SWS and Peer-report. The present results found poor agreement between the SI and the SWS. There is a need to evaluate the SWS's potential in predicting CHD in longitudinal studies and investigate

the degree to which the SWS' profiles are related to different manifestations of cardiovascular disorders.

Future research could attempt to establish the strength of peer-assessment techniques as an adequate measure of Type A by use of different criteria for defining peers (ie. including immediate family members and spouses). Furthermore, exposing peer-raters to situations involving subjects' reactions to provocation may generate overt Type A and B behavioral characteristics.

Given the cost, time effectiveness and the ease of scoring the SWS and the Peer-Report over the SI, and the advantage of being based on years of experience with the individual, rather than on 15 minutes in an atypical setting, prospective studies employing self-reports or peer-ratings of behavior type are a high priority for future assessments of coronary-prone behavior.

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Appendix A

Structured Interview

Structure Interview (Student Form)

INTRODUCTION: Most of the questions are concerned with your superficial habits and none of them will embarrass you. I would appreciate it if you would answer the questions to the best of your ability. Your answers will be kept in the strictest confidence. (Begin taping: emphasize capitalized words).

1. May I ask your age, PLEASE?

2. What is your student classification?
a. How long have you been at this university?

3. Are you SATISFIED with your school work thus far? (Why not?)

4. Do you feel that university carries HEAVY responsibility?
a. Is there any time when you feel particularly RUSHED or under PRESSURE?
b. When you are under PRESSURE does it bother you?

5. Would you describe yourself as a HARD-DRIVING, AMBITIOUS type of person in accomplishing the things you want, getting things done as QUICKLY as possible, OR would you describe yourself as a relatively RELAXED and EASY-GOING PERSON?
a. Do you have a boyfriend/girlfriend? (Close friend?)
b. How would he/she describe you ... as HARD-DRIVING and AMBITIOUS or as relaxed and easy-going?
c. Has he/she ever asked you to slow down in your work? NEVER? How would he/she put it ... in HIS/HER OWN words?

6. When you get ANGRY or UPSET, do people around you know it? How do you show it?

7. Do you think you drive HARDER to ACCOMPLISH things than most of your associates?

8. Do you complete homework assignments before they are due? How often?

9. Do you know any children between the ages of 6 and 8? Did you EVER play competitive games with them, like cards, checkers, Monopoly?
a. Did you ALWAYS allow them to WIN on PURPOSE?
b. WHY? (WHY NOT?)

10. When you play games with people your own age, do you play for the fun of it, or are you really in there to WIN?

11. Is there a lot of COMPETITION in school? Do you enjoy this?
a. Are you competitive in other areas .... sports for example?

12. When you are in your automobile, and there is a car in your lane going FAR TOO SLOWLY for you, what do you do about it? Would you MUTTER and COMPLAIN to yourself? Would anyone riding with you know that you were ANNOYED?

13. Most people who go to school have to get up fairly early in the morning ... in your particular case ... what ... time ... do you ... ordinarily ... get up?

14. If you make a DATE with someone for, oh, two o'clock in the afternoon, for example, would you BE THERE on TIME?
a. If you are kept waiting, do you RESENT it?
b. Would you SAY anything about it?

15. If you see someone doing a job rather SLOWLY and you KNOW that you could do it faster and better yourself, does it make you RESTLESS to watch?
a. Would you be tempted to STEP IN AND DO IT yourself?

16. What IRRITATES you most about this university, or the students here?

17. Do you EAT RAPIDLY? Do you WALK rapidly? After you've FINISHED eating, do you like to sit around the table and chat, or do you like to GET UP AND GET GOING?

18. When you go out in the evening to a restaurant and you find eight or ten people WAITING AHEAD OF YOU for a table, will you wait? What will you do while you are waiting?

19. How do you feel about waiting in lines: BANK LINES, SUPERMARKET LINES, CAFETERIA LINES, POST OFFICE LINES ...?

20. Do you ALWAYS feel anxious to GET GOING and FINISH whatever you have to do?

21. Do you have the feeing that TIME is passing too RAPIDLY for you to ACCOMPLISH all the things you'd like to GET DONE in one day?
a. Do you OFTEN feel a sense of TIME URGENCY? TIME PRESSURE?

22. Do you HURRY in doing most things?

Appendix B

Survey of Work Styles

(Removed copyright material)

Appendix C

Survey of Work Styles - Peer Report

Appendix A

SURVEY OF WORK STYLES (SWS)

Directions:

This questionnaire contains a number of statements describing work/school related activities. You are asked to rate your friend by filling in the appropriate oval on the IBM sheet that best describes how characteristic or uncharacteristic each activity is of his work/school related behavior. Try to use all five categories listed below in rating your friend. Answer every statement, even if you are not completely sure of your answer. If you feel that any statement cannot be applied to a work setting, then imagine your friend in a school setting and answer appropriately. Start on question 1 and fill in the corresponding oval (#1) on the IBM sheet provided.

1	2	3	4	5
extremely uncharacteristic	**moderately uncharacteristic**	**neutral**	**moderately characteristic**	**extremely characteristic**

1. He becomes quite irritated when he has to wait in line.
2. He rarely slams doors because he is angry.
3. Coworkers and friends would agree that he "lives, eats, and breathes" his job/school.
4. Even when work accumulates, he still takes time for a break.
5. He rarely gets praised for a well-done job/paper.
6. It would not bother him if other workers/students had experienced more success than him.
7. He does not get upset if he is interrupted while working.
8. He tends to lose his temper easily while working.
9. There are many things in his life more important to him than his job/studies.
10. He has often had to hurry to finish a project because there were so many other things to do.

1	2	3	4	5
extremely uncharacteristic	moderately uncharacteristic	neutral	moderately characteristic	extremely characteristic

11. He enjoys his job/school and likes most of his coworkers/students.
12. He would never let someone win a game.
13. Slow moving film plots bore him.
14. At work/school, he seldom feels grouchy.
15. He finds it difficult to relax on weekends because he is thinking about work/school.
16. He rarely engages in two or more activities at the same time, like eating and reading.
17. Supervisors/professors impose unrealistic standards on his performance.
18. He believes that organizations work best when employees/students do not compete with each other.
19. He would help a slow coworker/student, even if it delayed progress on his own work.
20. His coworkers would agree that he gets angry frequently.
21. He would leave a project or assignment unfinished if his work shift or school day was over.
22. Often, he works under so much pressure that he finds it very difficult to stop during the day, even if he wanted to.
23. There are many sources of personal satisfaction in his work/school.
24. He tries to seize every opportunity for advancement at work/school.
25. When he has a project to complete, he becomes impatient with the slightest interruption.
26. He seldom raises his voice when arguing.

1	2	3	4	5
extremely uncharacteristic	moderately uncharacteristic	neutral	moderately characteristic	extremely characteristic

27. His conversations are usually centred around work/school-related activities.
28. He usually leaves sufficient time to complete a job/assignment so that he doesn't have to rush through it.
29. He is dissatisfied with the way his supervisor/professor treats subordinates.
30. He would rather have his work evaluated as a team member rather than as an individual.
31. He has no problem with people who talk a lot and have little to say.
32. When things go wrong at work, he sometimes loses his temper.
33. He seldom takes his work/assignments home with him.
34. Because of deadlines, he has little time to take breaks.
35. He feels that the quality of his work is recognized by his supervisors/professors.
36. Part of the satisfaction of doing a good job is showing that he is better than other employees/students.
37. At work/school, he finds it irritating when people cannot come to a decision quickly.
38. He would remain calm, even if people at work/school were making fun of him.
39. He often becomes so involved at work/school that he loses track of time.
40. He rarely takes so much work that he has too little time to finish it.
41. He oftens feels that his job/schooling has very little future.

1	2	3	4	5
extremely uncharacteristic	moderately uncharacteristic	neutral	moderately characteristic	extremely characteristic

42. Competition rarely brings out the best in him.
43. He is patient with less competent coworkers/students.
44. He would react strongly if he were unfairly criticized at work/school.
45. His work/school schedule allows him a good deal of time for recreation.
46. He often must work faster than most people.
47. He finds it easy to talk with his supervisor/professor.
48. He hates to lose in a competition, even when the stakes are not high.
49. He finds it quite annoying when coworkers/students are not on time for a meeting.
50. He is tolerant of coworkers/students who try to annoy him.
51. All of his thoughts during work/school are related to work/school.
52. He rarely finds himself working on a number of urgent tasks at the same time.
53. He would like to have more freedom to decide how to do his work.
54. He has no interests in comparing his salary/grades to those of his peers.
55. He is patient with others who do not complete their task on time.
56. He would retaliate if insulted.
57. He would rarely cancel a social engagement in order to work.
58. He often must rush at the end of the day to finish accumulated work.
59. He seldom feels that his actions are misunderstood at work/school.

1	2	3	4	5
extremely uncharacteristic	moderately uncharacteristic	neutral	moderately characteristic	extremely characteristic

60. He becomes very annoyed when he cannot do a job better than someone else.
61. Dull-witted, slow employees/students make him very impatient.
62. He is an even-tempered person.
63. He usually shows up to work/school early to prepare things.
64. He is rarely the first person finished eating at the table.
65. He often wishes he had a different supervisor/professor.
66. He gets just as much satisfaction from seeing a friend succeed as he would from succeeding himself.
67. He does not become annoyed if a driver reacts too slowly when a stoplight changes green.
68. Sometimes he gets into such heated arguments that he finds himself shouting.
69. He rarely works more than eight hours a day.
70. He frequently finds himself rushing even when there is plenty of time.
71. He seldom feels frustrated at work/school.
72. He often compares his work to that of coworkers.
73. He would find it frustrating to have to explain the same thing over again to a new employee/student.
74. He would never hit anyone, even if he were hit first.
75. He rarely finds time for hobbies or other recreational activities.
76. He can usually finish his work on time without rushing.
77. If he could, he would prefer to retire now, rather than to continue working/studying at his present job.

1	2	3	4	5
extremely uncharacteristic	moderately uncharacteristic	neutral	moderately characteristic	extremely characteristic

78. He prefers a work/school environment where people cooperate rather than compete.
79. He does not usually aggravate others to have to wait for information needed to do his job.
80. If he were to become angry at work/school, he would remain "keyed up" for the rest of the day.
81. Work/school is a major part of his life.
82. He feels that he must fill every minute of his day with work, leaving little or no time to relax.
83. He feels that he is paid/marked fairly for the work he does.
84. If asked, he is sure that people would describe him as competitive.
85. He frequently finds himself wishing that other workers/students would complete their work more quickly.
86. At work/school, he avoids heated discussions and disagreements with coworkers/students.
87. He often feels the urge to go back to work/school on weekends or holidays.
88. Even when he has a urgent task to complete, he still takes "breaks" from work/school.
89. He often wishes for a totally different job/course.
90. If he plays a game, he would rather just "play for fun" than enter a tournament.
91. It does not bother him to have to repeat himself several times in order to be understood.

1	2	3	4	5
extremely uncharacteristic	moderately uncharacteristic	neutral	moderately characteristic	extremely characteristic

92. At work/school, annoying people sometimes make his blood "boil".
93. During his leisure time, he rarely thinks about his job/school.
94. He works best under pressure.
95. He feels that his job/schooling is quite satisfying.
96. In sports, as in life, the only thing that matters to him is winning.

Appendix D

Cook-Medley Hostility Scale

HO SCALE

This scale consists of numbered statements. Read each statement and decide whether it is true as applied to you or false as applied to you.
If a statement is TRUE or MOSTLY TRUE, as applied to you, circle the letter T at the left of the statement. If a statement is FALSE or NOT USUALLY TRUE, as applied to you, circle the letter F at the left of the statement.
Remember to give YOUR OWN opinion of yourself. Do not leave any blank spaces if you can avoid it. Now go ahead.

T F 1. When I take a new job, I like to be tipped off on who should be gotten next to.

T F 2. When someone does me a wrong I feel I should pay him back if I can, just for the principle of the thing.

T F 3. I prefer to pass by school friends, or people I know but have not seen for a long time, unless they first speak to me.

T F 4. I have often had to take orders from someone who did not know as much as I did.

T F 5. I think a great many people exaggerate their misfortunes in order to gain the sympathy and help from others.

T F 6. It takes a lot of argument to convince most people of the truth.

T F 7. I think most people would lie to get ahead.

T F 8. Someone has it in for me.

T F 9. Most people are honest chiefly through fear of being caught.

T F 10. Most people will use somewhat unfair means to gain profit or an advantage rather than to lose it.

T F 11. I commonly wonder what hidden reason another person may have for doing something nice for me.

T F 12. It makes me impatient to have people ask my advice or otherwise interrupt me when I am working on something important.

T F 13. I feel that I have often been punished without cause.

T F 14. My relatives are nearly all in sympathy with me.

over

T F 15. I am against giving money to beggars.

T F 16. Some of my family have habits that bother and annoy me very much.

T F 17. My way of doing things is apt to be misunderstood by others.

T F 18. I don't blame anyone for trying to grab everything he can get in this world.

T F 19. No one cares much what happens to you.

T F 20. It is safer to trust nobody.

T F 21. I do not blame a person for taking advantage of someone who lays himself open to it.

T F 22. I have often felt that strangers were looking at me critically.

T F 23. Most people make friends because friends are likely to be useful to them.

T F 24. I am sure I am being talked about.

T F 25. I am likely not to speak to people until they speak to me.

T F 26. Most people inwardly dislike putting themselves out to help other people.

T F 27. I tend to be on guard with people who are somewhat more friendly than I had expected.

T F 28. I can be friendly with people who do things which I consider wrong.

T F 29. I have sometimes stayed away from another person because I feared doing or saying something that I might regret afterwards.

T F 30. People often dissapoint me.

T F 31. I like to keep people guessing what I'm going to do next.

T F 32. I frequently ask people for advice.

over

T F 33. I have often met people who were supposed to be experts who were no better than I.

T F 34. I would certainly enjoy beating a crook at his own game.

T F 35. It makes me feel like a failure when I hear of the success of someone I know well.

T F 36. I have at times had to be rough with people who were rude or annoying.

T F 37. People generally demand more respect for their own rights than they are willing to allow for others.

T F 38. There are certain people whom I dislike so much that I am inwardly pleased when they are catching it for something they have done.

T F 39. I am often inclined to go out of my way to win a point with someone who has opposed me.

T F 40. I am quite often not in on the gossip and talk of the group I belong to.

T F 41. The man who had most to do with me when I was a child (such as my father, stepfather, etc.) was very strict with me.

T F 42. I am not easily angered.

T F 43. I have often found people jealous of my good ideas, just because they had not thought of them first.

T F 44. When a man is with a woman he is usually thinking about things related to her sex.

T F 45. I do not try to cover up my poor opinion or pity of a person so that he won't know how I feel.

T F 46. I have frequently worked under people who seem to have things arranged so that they get credit for good work but are able to pass off mistakes onto those under them.

T F 47. I strongly defend my own opinions as a rule.

T F 48. People can pretty easily change me even though I thought that my mind was already made up on a subject.

over

T F 49. Sometimes I am sure that other people can tell what I am thinking.

T F 50. A large number of people are guilty of bad sexual conduct.

Appendix E

Sequence of Events Leading to and Including Present Study

Initial screening of 700 male university introductory psychology students
completion of questionnaires
(SWS, Lifestyles Questionnaire, HO)

Selection of 100 subjects
(based on Lifesyles Questionnaire)

Fitness Test
Treadmill Exercise
(individually tested--V02max
blood samples and cardiovascular
measures were taken)

Structured Interview
(individually tested)

Stroop Color Naming Task
(individually tested--blood samples and cardiovascular measures were taken)
(** this phase was of importance to present study)

Present Study
1. Subjects called and nominate peers.
2. Peers are contacted for experiment.
3. Peers complete the questionnaire. (third person form of the SWS)

Appendix F

Experimental Questionnaire

We are conducting a follow-up to experiment PLATS that you recently completed. In that study we were interested in relating psychological characteristics as provided by your responses to questions to physiological measures of fitness and your health. In the follow-up, we are interested in comparing your descriptions of yourself with someone who knows you well on these same measures of fitness and health. In order that we may complete this study, we require your permission to administer some questionnaires to on of your friends. We are interested in their general description of you on these questionnaires. Please provide us with the names and addresses of three of your closest friends. These individuals should have known you for at least one year, have observed you in several situations, and are not members of your immediate family (ie. brothers, sisters, or parents). Also, these individuals should be able to come to the university. One of your three friends will be chosen and called to participate in this follow-up experiment. We are asking for three names so that we may have some back-up in the event that someone should refuse or be unable to come. If one of your friends actually completes this experiment, you will receive $5 and your peer will receive $10. This experimental session will be approximately 1/2 hour long. Your responses will be kept confidential as well as those of your peers. Only group responses will be compared (ie. your group vs your peer group).

1 = very little 5 = moderate 9 = very much

1. Name: _____ Telephone #:_____.

Address _____(apt #, street, box #)

_____(city, province) _____(postal code)

How well do you know_____? 1 2 3 4 5 6 7 8 9

2. Name: _____Telephone #:_____.

Address _____(apt #, street, box #)

_____(city, province) _____(postal code)

How well do you know_____? 1 2 3 4 5 6 7 8 9

3. Name: _____Telephone #:_____.

Address _____(apt #, street, box #)

_____(city, province) _____(postal code)

How well do you know_____? 1 2 3 4 5 6 7 8 9

Mailing Address of subject for $.

Name: _____ _____

Address ____ _____(apt #, street, box #)

_____ _____(city, province) _____(postal code)

Fitness Followup

I, _____ _____ will be representing my friend _____ _____ in the following questionnaire. I understand that upon my completion of this questionnaire, I will be renumerated immediately for my participation and my friend will receive renumeration (by mail).

How well do you know your friend?

1 2 3 4 5 6 7 8 9

as an acquaintance ... like a brother

I, _____ _____ have received $10 for my participation in this experiment.

Date: _____ 1989.

Signature: _____