

Type A Behaviour and Aggression: Provocation, Conflict  
and Physiological Responsivity in the Buss Teacher-learner  
Paradigm.

by

Nukte Edguer



A dissertation presented to the  
University of Manitoba Department of Psychology  
in partial fulfillment of the requirements  
for the degree of Ph.D.

**TYPE A BEHAVIOUR AND AGGRESSION: PROVOCATION, CONFLICT  
AND PHYSIOLOGICAL RESPONSIVITY IN THE BUSS TEACHER-  
LEARNER PARADIGM**

**BY**

**NUKTE EDGUER**

A thesis submitted to the Faculty of Graduate Studies of  
the University of Manitoba in partial fulfillment of the requirements  
of the degree of

**DOCTOR OF PHILOSOPHY**

© 1987

Permission has been granted to the LIBRARY OF THE UNIVER-  
SITY OF MANITOBA to lend or sell copies of this thesis, to  
the NATIONAL LIBRARY OF CANADA to microfilm this  
thesis and to lend or sell copies of the film, and UNIVERSITY  
MICROFILMS to publish an abstract of this thesis.

The author reserves other publication rights, and neither the  
thesis nor extensive extracts from it may be printed or other-  
wise reproduced without the author's written permission.

To my father,

with my love

## ACKNOWLEDGEMENT

The processes of the mind belong to each individual but the products of these processes belong to many. Many people have contributed to this project in various capacities, either directly or indirectly through their influence on my personal and intellectual development. Among the people, who directly contributed to this project as well as to my development, my first and biggest thanks must go to Michel Janisse. He has been my advisor and a very special person in my life, who has made a difference in my personal and academic development. In addition to the time, energy and hard work he has invested in my development as well as in this project in various forms, his vision of scholarship, his stimulating insights in the discussions we had and his encouragement of my interests and activities have broadened my direction in life. Michel's understanding and acceptance of human nature, his unconditional moral support and his good sense of humour, not only have given me strength and reinstated my hope at times when I needed it most, but also contributed to my understanding and acceptance of people and life.

I would also like to thank my committee members, Marion Aftanas, Dennis Dyck, Roger Wilson, Charles Weinstein and Robert Tait (the Departmental representative at the proposal oral) for providing a valuable source of intellectual and social support. Dennis Dyck, in many ways my other advisor and a friend has put a great deal of his time and effort into this project, provided valuable insight and feedback as well as much encouragement and moral support. Roger

Wilson, my constant supporter and a friend, in addition to his constructive criticism regarding this project, has rekindled my interest in physiology especially with our stimulating discussions on Lacey's paradigm, listened to my problems with genuine interest and provided me with sound advice, continuous support and encouragement. Marion Aftanas, my professor and committee member has provided me with careful, well-founded constructive criticism and gave me strength with his care and interest in students.

In addition, without the expert knowledge and hard work of Philip Gerson and Les Bell who set up the system necessary for data collection and withstood with my panic attacks with good sense of humour, John Cortens and Arlen Nimchuk who competently dealt with the demands of the experiment as the confederate, and the participants who were the essential component of this experiment, this project could not be completed as it is. In the same line, without Anis Mikhail's acceptance of me to this program as a Ph.D. student and his continuous provocative challenges I would not have the opportunity to conduct this study.

Last, but not the least my heartfelt thanks go to my close family members, especially my uncle Nihat Edguer, my mother Feride Edguer, my sister Beste Edguer and my brother Tahsin Edguer and to my dear friends here and elsewhere, whose trust in me gave me strength to keep on going and whose love gave me the courage to try the new and the unknown by knowing that no matter what, I shall always have a place in their hearts.

Winnipeg, April, 25, 1987

## Table of Contents

Contents	Page
ABSTRACT.....	1
INTRODUCTION.....	3
The Type A Behaviour Pattern.....	3
Components of the TABP.....	3
Assessment of the Type A Behaviour Pattern.....	5
Type A behaviour Pattern and Coronary Proneness...	7
Models of Type A Behaviour.....	10
Aggression and Coronary Heart Disease .....	13
Type A Behaviour and Aggression .....	16
The Purpose of the Study .....	28
Hypotheses.....	30
METHOD.....	33
Subjects.....	33
Material.....	34
Equipment.....	36
Experimental Task .....	37
Procedure .....	38

RESULTS .....	44
Behavioural Aggression .....	44
Self-report Measures of Affect .....	48
Expectations .....	49
Motivation .....	50
Physiological Measures .....	53
DISCUSSION .....	61
REFERENCES .....	74

## List of Tables

Table	Page
1 Means and standard deviations of noise duration as a function of behaviour type.....	47
2 Means and standard deviations of the luck ratings as a function of provocation and conflict.....	51
3 Raw score means and standard deviations of systolic blood pressure as a function of behaviour type, provocation and conflict: I .....	54
4 Raw score means and standard deviations of systolic blood pressure as a function of behaviour type, provocation and conflict: II .....	54
5 Raw score mean heart rate and standard deviations as a function of behaviour type, provocation and conflict...	58



## List of Figures

Figure		Page
1	Noise levels selected by Type As in comparison to Type Bs over trials.....	45
2	Noise duration as a function of behaviour type, provocation and trials.....	46
3	Anxiety scores over time as a function of provocation.....	49
4	Mean reported freedom in using noise as a function of Type A behaviour, provocation and conflict.....	52
5	Mean change in systolic blood pressure as a function of behaviour type and conflict.....	55
6	Raw score mean heart rates as a function of behaviour type provocation and conflict.....	57

## ABSTRACT

This study provided a parametric evaluation of provocation and conflict on aggressive and physiological reactions of male Type A and Type B college students. Subjects classified as Type A or Type B on the basis of the Structured Interview, were assigned to one of the four conditions: 1) Provocation-conflict 2) Provocation-no conflict 3) No provocation-conflict 4) No provocation-no conflict. The subjects were assigned to teach concepts in the Buss teacher-learner paradigm using noise as negative feedback for incorrect responses and points as positive feedback for correct responses. Before the task, subjects in the provocation conditions received a negative evaluation from the confederate while subjects in the no provocation conditions received a neutral evaluation. The subjects in the conflict condition were told that they would exchange places with the learner in the second part of the experiment while the subjects in the no conflict condition were told that they would be the learner with a new subject as their teacher. The dependent variables were behavioural aggression as reflected by the level and the duration of the noise and the levels of points, self-reported affect, blood pressure and heart rate.

The results indicated no evidence of more aggression with Type As in comparison to Type Bs. In fact, Type Bs showed a tendency to use higher levels of noise during the first five negative feedback trials. Furthermore, with noise duration, nonprovoked Type As used shorter durations of noise over time. For Type As, both provocation and conflict had to be present for an increase in the duration of noise whereas for Type Bs conflict was sufficient to increase noise

duration. On the other hand, results with self-report measures of affect (MAACL) and physiological measures indicated that relative to Type Bs, Type As reported significantly more hostility and depression and showed larger magnitudes of heart rate. Moreover, the conflict condition increased the systolic blood pressure of Type As but not of Type Bs.

These results, in line with Glass's (1977) control hypothesis, suggest that Type As attempt to control not only their environment, but their own reactions to stressors as well. Although Type As may be affected both emotionally and physiologically when provoked or presented with a conflict situation, whether they will react to a situation in an aggressive manner seems to depend on the kind and the level of a stressor. Thus, different kinds of stressors will have different effects, for example a mild stressor may enable the Type A to maintain behavioural control, but as the intensity of a stressor increases they may become more aroused and show aggression. Aggression, whether shown directly or not, may also have implications at the physiological level in that a prolonged and exaggerated arousal associated with the inhibition of overt behaviour may increase the risk of CHD.

## INTRODUCTION

The Type A behaviour pattern (TABP) is an epidemiological construct developed by Friedman and Rosenman (1959), based on their observations of the patients with coronary heart disease (CHD). Noticing that cardiac patients seemed to have specific behavioural characteristics and the failure of the standard risk factors to predict the occurrence of the CHD, these researchers began to study the behavioural characteristics of cardiac patients systematically. As a result of these investigations, behavioural characteristics were identified and labeled as Type A behaviour pattern (TABP).

Friedman and Rosenman (1959) defined the Type A behaviour as "an action-emotion complex that can be observed in any person who is aggressively involved in a chronic, incessant struggle to achieve more and more in less and less time, and if required to do so against the opposing efforts of other things or other persons." (p,67). The major components of TABP are extreme aggressiveness, easily aroused hostility, time urgency and competitive achievement striving (Rosenman, 1978).

### The Type A Behaviour Pattern

#### Components of the TABP

The TABP construct consists of three major components which are assumed to play a primary role in predisposing one to CHD. These components are: 1) Time urgency, 2) Hostility /Aggression, 3) Hard driving/competitive achievement striving.

Time urgency. Some research has provided support for the contention that Type As have a chronic sense of time urgency in comparison to Type Bs. For example, in estimating time Type As report faster passage of time than do Type Bs (Burnam, Pennebaker, Glass, 1973; Gastorf, 1980). Even in situations where there is no forewarned time deadline, Type As work more quickly than Type Bs (Burnam, Pennebaker, Glass, 1975). In the same vein, Glass, Snyder and Hollis (1974) report Type As receiving significantly lower percentages of total reinforcement during a task involving differential reinforcement of low rates of responding. These results indicate that Type As have a tendency to respond faster than Type Bs.

Hostility and Aggression. Hostility and aggression have been conceptualized as variables closely associated with the development of CHD (eg, Diamond, 1982). When there is a threat to their sense of competence and mastery, the research indicates Type As behave more aggressively than Type Bs (Carver and Glass, 1978) and the nature of this aggression to be hostile rather than instrumental (Strube, Turner, Cerro, Stevens, Hinchey, 1984; Check and Dyck, 1986).

Hard driving/Competitive achievement striving. In relation to the third component of the TABP, the research indicates Type As have relative to Type Bs have higher achievement scores (Matthews and Saal, 1978; Gastorf and Teevan, 1980); report receiving more honors and being more active in high school athletics (Glass, 1977), reach higher occupational status (Waldron, 1978); and, receive more rewards from their work (Matthews, Helmreich, Beane and Lucker, 1980).

Further, the research suggests Type As: have excessively high and often inflexible standards for performance despite their actual performance not differing from Type Bs (Glass, 1977; Snow, 1978); bring challenge even to situations in which there is no external demand to perform well (Gastorf, 1980); compete more with others (Van Egeren, Abelton, and Thornton, 1978; Van Egeren, Sniderman and Raggelin 1982; Glass, 1977); and suppress subjective feelings of fatigue during a difficult task (Carver, Coleman and Glass, 1976). Collectively these results suggest a high drive for achievement for Type As relative to Type Bs.

#### Assessment of the Type A Behaviour Pattern

Assessment of the TABP in the literature mostly involves two different types of measures; the Structured Interview (SI) and one of several questionnaires. Some of the self-report measures of the TABP are the Jenkins Activity Survey (JAS), the Framingham Type A Scale, and the Bortner Rating Scale. In addition to these measurement techniques, attempts have been made to assess the TABP with other techniques such as the Bortner Performance Battery (Bortner & Rosenman, 1967) and various assessments of speech stylistics (Friedman, Brown and Rosenman, 1969; Schucker & Jacobs, 1977). Among these various measurement techniques, the most important one and the most widely used has been the SI.

The SI, first used in the Western Collaborative Group Study (WGCS) (Rosenman, Friedman, Straus, Wurm, Jenkins, & Wurm, 1966;

Rosenman, Friedman, Straus, Jenkins, Zyzanski, Wurm, 1970; Rosenman, Brand, Jenkins, Friedman, Straus, Wurm, 1975), consists of twenty-two questions assessing the TABP content. The questions, which can be elaborated by the interviewer, are asked in such a way as to elicit the TABP. Thus, the SI assessment of the TABP depends upon two factors, the exhibition of the TABP by the subject and the ability of the interviewer to elicit such behaviour. During the interview, both the content of the subject's responses and his/her overt behavior (voice stylistics, speech pattern, tone of voice, motor behaviour, potential for hostility) are assessed.

The reliability of the SI was assessed by test-retest reliability and interobserver reliability. Using the WCGS data for 1000 subjects the test-retest reliability was found to be  $r=.82$  over a 12-20 month period for the dichotomous A-B classification and somewhat lower using the four point scale classification (A1,A2,B3,B4) (Jenkins, Rosenman and Friedman, 1968). Interobserver reliability was found to be between 75-90% (Caffrey, 1968; Jenkins, Rosenman & Friedman 1968; Matthews, Glass, Rosenman & Bortner, 1977). These results indicate good reliability for the interview method of assessment.

The validity of a test indicates the extent to which it measures what it purports to measure. The SI, has been found to be associated with the prevalence of CHD in several epidemiological studies such as the WCGS (Rosenman, Friedman, Straus et al., 1966; 1970;1975), and in a prevalence study of CHD in 26 North American monasteries, (Caffrey, 1970; Quinlan, Barrow, Moinuddin, 1968). In addition to these epidemiological studies, clinical research indicates that there is an

association between the TABP measured by the SI and the recurrence of myocardial infarction (Rosenman, Friedman, Jenkins et al., 1967; Jenkins, Zyzanski and Rosenman, 1976) and the severity of atherosclerosis (Blumenthal, Williams, Kong et al., 1978; Frank, et al., 1978; Krantz, Sanmarco, Silvester and Matthews, 1979). Furthermore, many psychological and psychophysiological studies (Matthews, 1982) support the validity of the SI leading support to the conclusion that it has high predictive and construct validity.

#### Type A Behaviour Pattern and Coronary Proneness

The TABP concept as stated previously was developed by Rosenman and Friedman as a result of their early systematic study of behavioural characteristics which seemed to be predominant among cardiac patients in comparison to non-cardiac patients. Support for the TABP concept as a CHD risk factor, however, has come from both epidemiological and clinical studies.

One of the most important studies associating the TABP with the development of CHD is the Western Collaborative Group Study (Rosenman, Friedman, Straus, Wurm, Jenkins, Wurm, 1966; Rosenman, Friedman, Straus, Jenkins, Zyzanski, et al., 1970; Rosenman, Brand, et al., 1975). In this study 3154 men free of CHD who were identified as Type As and Bs were followed for a period of 8 1/2 years. The results of the study indicated that Type A subjects had a higher incidence of CHD in comparison to Type Bs, suggesting the TABP to be a risk factor. It was found that Type As had a 2.37 times more estimated risk in



comparison to Type Bs. After adjustment for all the standard risk factors, Type As still had a 1.97 ( $p < .001$ ) times more estimated risk in comparison to Type Bs, leading the authors to conclude "it seems clear that behavior pattern A indicates a pathogenic force operating in addition to, as well as in conjunction with the classical risk factors (Rosenman, et al., 1975, p.877)."

The conclusion that the TABP is an independent risk factor is further supported in another epidemiological study, the Framingham Heart study (Haynes, Levine, Feinleib, Scotch and Kannel, 1978). Here, the incidence of CHD in males classified as Type As was 1.9 ( $p < .006$ ) times greater in comparison to Type Bs in the 39-49 years age group, and 2.1 ( $p < .0015$ ) times greater in the 50-59 years age group, respectively. Further evidence for the association of the TABP and CHD comes from another large scale research Belgian Heart Disease Prevention Project (Kornitzer, Kittel, De Backer & Dramaix, 1981). In this study, the association between the TABP and CHD was significant in angina pectoris patients, patients with EKG abnormalities and a history of heart disease. It was also found that those with EKG abnormalities without angina or any history of heart disease scored higher on the speed and impatience subscale of the Type A measure.

In addition to various epidemiological studies providing evidence for the association of the TABP and CHD, clinical research indicates that the TABP is associated with greater risk of recurrent myocardial infarction (MI) (Rosenman, Friedman, Jenkins et al., 1967; Jenkins, Zyzanski, Rosenman and Cleveland, 1971; Jenkins, Zyzanski and Rosenman, 1976) and the severity of atherosclerosis (Blumenthal, Kong,

Rosenman et al., 1975; Zyzanski, Jenkins, Ryan, Flessas and Everest, 1976; Frank, Heller, Kornfeld et al., 1978; Blumenthal, Williams, Kong, Schanberg and Thompson, 1978; Krantz, Sanmarco, Silvester, and Matthews, 1979).

These studies support the association of the TABP with CHD. As a result, the TABP is sometimes referred to as "coronary prone behaviour." However, as pointed out by the Review Panel on Coronary Prone Behaviour and Coronary Heart Disease (Cooper, Detre, and Weiss, 1981) designating the TABP as the coronary prone behaviour pattern (CPBP) regardless of relationships described above, is not recommended. First of all, the majority of the research is correlational in nature and does not imply causation. In addition, as stated by the Review Panel, TABP may have broader health implications and by using the term CPBP undue emphasis has been placed on the predictive relationship of TABP with CHD. This relationship is still under investigation. Therefore, the Review Panel suggests the term CPBP to be reserved to denote any behavioural manifestation under consideration with respect to its relationship to CHD, which would free CPBP from unnecessary restriction to TABP as well as broaden the scope of TABP for other health implications. In sum, considering the points raised by the Review Panel, there is insufficient evidence to suggest that the concepts of TABP and CPBP are isomorphic and can be used interchangeably.

The above conclusion begs the question of the relation of the TABP to the CPBP. The answer to this question is associated with the mechanisms (psychological, physiological) through which the TABP

predisposes one to CHD, which are largely unknown. The atheoretical approach taken in Type A research at the beginning, led to an accumulation of data and the establishment of the TABP as a construct related to CHD, but also delayed integration and analysis of the two constructs. The models to explain the association of the TABP and CHD emerged within the last decade. Although none of these models are complete, they attempt to integrate the Type A area and generate questions of 'why' and 'how' to understand the underlying mechanisms of the TABP. Some of these models will be presented in the next section.

#### Models of Type A Behaviour

As stated above, TABP has been associated with increased risk of CHD, but the underlying mechanism for this association is yet to be known. However, there are several models proposing enhanced sympathetic activity as the process predisposing individuals to CHD. The psychological processes which lead to sympathetic activity differ from model to model.

For example, Scherwitz, Berton, and Leventhal (1978), argue that Type As are more self-involved than Type Bs which accounts for both the speech characteristics and autonomic reactions of Type A individuals. Glass (1977), suggests that Type A behaviour reflects a specific way of coping with stress in that Type A individuals attempt to assert and maintain control more so than Type Bs, leading to increased sympathetic activity. Matthews and Siegel (1982) argue that

another basis for Type A behaviour is a combination of a strong value system favoring productivity and ambiguous standards for evaluating the productivity. In other words, as in the case of the other two approaches, Type A behaviour reflects a value system emphasizing 'having' rather than 'being' mode of existence as an approach to life. Having control over events, or having things which are ambiguously defined, affirm the well-being that Type As struggle to keep at the expense of CHD risk. These conceptualizations assume that Type A behaviour originates in interaction with the environment from a psychological substrate. This then leads to the overt behaviours of Type A and the associated pathogenic mechanisms through enhanced sympathetic activity.

A different, but not necessarily incompatible view (Krantz and Durel, 1983), conceptualizes Type A behaviour as originating from an interaction of an underlying constitutional trait of sympathetic reactivity and the individual's cognitive reactions to a particular situation, including cognitive information of peripheral sympathetic responses. In this approach, an underlying biological (e.g., genetic) or psychobiological factor (e.g., early conditioning of physiological responses) is assumed to be at the basis of Type A behaviour and it is suggested that there may be a bi-directional reciprocal relationship between Type A behaviour and physiological reactivity. In other words, based on this biological substrate of reactivity, Type A individuals may exhibit increased sympathetic activity in situations perceived as challenging, and the perception of the peripheral sympathetic responses can further enhance somatopsychic effects of Type A behaviour.

As is the case with the psychological approaches, this approach has also gained empirical support. Pharmacological studies using beta blockers and results of two coronary by-pass studies (Kahn, Kornfeld, Frank, Heller, and Hoar, 1980; Krantz, Durel, Davia, Schaeffer, Arabian, Dembroski and MacDougall, 1982) in which Type As exhibited greater blood pressure magnitudes than Type Bs under general anesthesia, suggest an underlying biological substrate of Type A behaviour.

In sum, several conclusions can be derived from these various approaches to explain the dynamics of the Type A behaviour pattern. First, in conceptualizing TABP, any model should take into account both psychological and physiological processes. Perhaps an important issue in this regard is whether psychological processes lead to physiological reactivity as indicated in psychological models or whether there is a dynamic interaction between the two as suggested by Krantz and Durel (1983). A second derivative issue to be considered is whether the relationship between physiological and psychological processes is static or dynamic. A third issue to be addressed is the relationship of Type A behaviour to CHD. There may be various ways to conceptualize this relationship. A similar but narrower classification of the relationship of Type A to CHD can also be seen in the conclusions of the Review Panel (Cooper, Detre and Weiss, 1981) in which two models are presented. The first model proposes a direct relationship between TABP and CHD with the mediating link being stress related autonomic neuro-endocrine mechanisms. The second model conceptualizes TABP and CHD as a manifestation of a central aggressive

constitutional trait, which may be a result of genetic and/or early experiential factors. According to the second model, an aggressive constitutional trait may show itself as TABP in the psychophysiological context and as CHD in the somatic context. Given the limited knowledge we have about both TABP and CHD, it is not preferable to make a decision among these alternate conceptualizations at this point. The issue of the association of TABP with CHD, as well as other possible health implications, need to be considered in the future conceptualizations of the Type A construct.

#### Aggression and Coronary Heart Disease

Since the introduction of the Type A behaviour pattern, a great deal of research has been conducted and different viewpoints have been offered to explain the psychological basis of TABP. Matthews (1982), indicates that the research associated with the psychological correlates of the TABP has focused on time urgency and the achievement orientation components of the TABP. In contrast there are surprisingly few studies investigating the aggression component. Beyond being a component of TABP which has been paid little attention, aggression has also been associated with CHD independent of TABP (Carruthers, 1969), suggesting a need for further investigation of this component of TABP.

Aggression, has been defined in a variety of ways in the literature. From these definitions three components, the delivery of a noxious stimulus to another, the intent to injure by such delivery

and the expectancy of harming the victim appear to be the components in delineating aggression. In view of these components, aggression can be considered as any form of behaviour including the delivery of noxious stimuli directed toward the goal of harming and injuring another living being with the expectation of reaching the goal and having the intended effect. Two concepts closely associated with aggression are anger and hostility. Anger can be defined as an emotional response with specific autonomic and skeletal-facial components (Buss, 1961). On the other hand, hostility can be defined as an attitudinal response involving negative feelings (ill will) and negative evaluations of people and events which endures (Buss, 1961).

Research indicates a biological basis for aggression, and physiological changes during aggression and anger which may be associated with the increased risk of coronary heart disease especially, when prolonged and exaggerated. In line with these physiological changes occurring during anger and aggression and the increased risk of CHD, the analysis of the data from the Framingham study (Haynes, Feinleib, and Kannel, 1980) indicate that anger expression is related to CHD risk. In this study, it was found that men who did not show anger were at an increased risk of developing CHD. In the same study it was also found that not showing anger when provoked, predicted the incidence of CHD in women independently when standard risk factors and other psychosocial variables were statistically controlled. Similarly, Barefoot, Dahlstorm, and Williams (1983) and Shekelle, Gale, Ostfeld and Oglesby (1983) found a relationship between hostility and CHD. In the Barefoot et al., study,

individuals who scored high on the Cook and Medley (1954) hostility scale had a five-fold higher incidence of CHD during a 25 year period. The results from Shekelle et al., (1983) study also indicated that men who had high hostility scores also had a higher incidence of CHD over a 10 year period. Both studies also found hostility scores to predict mortality.

Although, in these two studies the TABP was not assessed, based on the physiological mechanisms related to anger and aggression together with the results of the Framingham study (Haynes, et al., 1980), it can be argued that aggression may be a mediating variable in the development of CHD, independent of the TABP. One can speculate that the longer the duration of anger/aggression, the longer the sympathetic arousal will be, creating physiological changes in the system. As the number of such incidents of prolonged arousal increase, the risk of CHD will increase. This implies that anything which decreases the duration of the sympathetic arousal, will decrease the impact of changes in the system. In line with this, Obrist (1981) argues that cardiac-somatic uncoupling in which there is an exaggerated physiological response not matching the somatic requirements, puts the organism at risk. Overt aggression in the presence of sympathetic arousal is consistent with cardiac-somatic coupling, in that although there will be physiological changes in the system due to arousal, these changes will not be exaggerated as in the cardiac-somatic uncoupling. Second, overt aggression may at times help to overcome a threat and therefore leading to decreased sympathetic arousal or physiological catharsis. The results of the Framingham



study (Haynes, et al., 1980), in which anger expression was found to be a variable predicting CHD, is suggestive of this line of thought. Furthermore, other research provides some evidence that suppressed hostility may be related to essential hypertension. For example, Harburg, Erfurt, Chape, Hauerstein, Schull (1973) found that the suppressed hostility pattern, assessed by self-reports about anger expression and guilt to hypothetical provocative situations, was associated with elevated blood pressure (BP) levels in black Americans. Similarly, in a later study (Harburg, Blakelock, and Roeper, 1979), which investigated styles of coping with anger provocation it was found that reflective coping was associated consistently with lower levels of BP in comparison to resentful coping. In the context of these results, the role of anger expression on physiological arousal needs to be considered.

#### Type A Behaviour Pattern and Aggression

The research investigating the TABP also supports the importance of hostility/aggression in relation to coronary heart disease. In an epidemiological study, Williams (1980), investigated the association of TABP defined by the SI and hostility defined by Cook and Medley Hostility Scale (1954) with coronary occlusion in 424 male and female patients referred for coronary arteriography. The results indicated that sex, hostility and TABP were independently related to CHD. Furthermore, there was an increasing gradient of risk for CHD, low hostility non-Type A females (12.5 percent) being on the low end of the gradient and high hostility Type A males (82 percent) being on the

high end. In this study, however, both the SI and the Cook and Medley hostility scales were administered after the participants had been referred for arteriography. Thus, the study was retrospective and it would be difficult to reach conclusions about the relationship of the TABP and hostility to CHD.

On the other hand, two prospective studies, the WCGS and the Framingham, established a clear relationship between the TABP, hostility and development of CHD. These studies indicate that both TABP and hostility may be among the predisposing factors to CHD. In a reanalysis of the WCGS data Matthews, Glass, Rosenman, and Bortner (1977) applied factor analytic procedures to the individual SI items for each subject and the relationship of each factor score to the development of CHD for a selected sample of 62 (73 percent Type A and 27 percent Type B) CHD cases matched with 124 non-CHD control group. The results indicated a grouping of five factors for the SI items which were labeled: competitive drive, past achievements, non-job achievement, impatience, and speed. Among these factors, only competitive drive and impatience were related to CHD. Within these two factors, the means of four of the eight individual items were significantly higher for CHD cases in comparison to non-coronary control group. These items were: explosive voice modulation, potential for hostility, irritation at waiting in lines, and vigorous answers, which suggest that vigour, drive, impatience and hostility are important factors closely associated with CHD risk.

Similarly, the results of the Framingham study (Haynes et al., 1978) indicated a relationship between TABP, hostility and CHD, both

among females and males. In this study, a 300 item questionnaire, including items for self-reported Type A behaviour, anger symptoms and anger management, was administered to 1674 coronary-free individuals. The results indicated that anger symptoms (e.g., when angry do you feel hot?) correlated with both the TABP and future CHD. However, in terms of anger expression, not showing (anger-in) or discussing (anger-discuss) anger was found to predict the development of CHD while overt anger expression (anger-out) did not. This relationship between suppressed anger and CHD was found to be independent of TABP and CHD. The result related to anger symptoms is consistent with the conceptualization of the TABP. Similarly, the results of anger expression are in line with the studies in catharsis research suggesting the role of anger in the development of CHD being probably wider in scope than TABP. In the context of anger expression and TABP, Hicks and Hodgson (1981) investigated the relationship of overt versus covert hostility and TABP. The results suggested that although Type As and Type Bs do not differ in covert hostility, Type As express more overt hostility than Type Bs. This result, viewed in conjunction with the results of the WCGS (Matthews et al., 1977) and Framingham study (Haynes et al., 1978) indicates that Type As appear to be more openly hostile than Type Bs, and hostility is related to CHD. On the other hand, based on the Framingham study and research in hypertension, it appears that another variable related to hostility and increased CHD risk independent of TABP is anger expression. In the context of these results it can be argued that increased hostility, as seen in TABP, increases the risk of CHD. However, those Type As who do not express their hostility are perhaps at a greater

risk of CHD than those who do express since suppressed hostility is also associated with CHD independent of TABP.

In regard to experimental research, several studies of TABP provided some insight to its aggression component. Dembroski, MacDougall, Herd, Shields (1979), categorized subjects on two dimensions, A/B and hostility/competition, on the basis of SI. Subjects were then given a cold pressor and the reaction time task in high and low challenge situations. It was found that Type As show high physiological arousal under high challenge situations. Yet, a group of Type As under low challenge, identified as high in hostility/competition, showed comparable physiological arousal to Type As in high challenge situations. Thus, Dembroski et al., (1979) concluded that high hostile Type As may perceive even mildly challenging situations as highly challenging and therefore respond with excessive cardiovascular arousal. In another study, Carver and Glass, (1978) found that JAS defined Type As delivered more shocks to a confederate in the Buss teacher-learner paradigm in comparison to Type Bs following harassment during a difficult task. Since in this study, harassment by the confederate was confounded with frustrated effort during provocation, in a second study Carver and Glass, included a frustration only condition. The results of this study indicated that both harassment and frustration lead Type As to behave aggressively but the significant A/B difference occurred following frustration. There were no physiological measures or self-report measures of anger (i.e., motivation to behave aggressively) taken in this study.

Glass et al., (1980) assessed physiological arousal during competition which may be interpreted as a physiological correlate of instrumental aggression. It was found that SI defined Type As showed an increase in catecholamines and cardiovascular indices compared to Type Bs during the competitive pong game following harassment. There was no difference in physiological indices between Type As and Bs during competition in the condition where there was no prior harassment. The observed physiological arousal in Type As following harassment by the confederate, may lead one to speculate that Type As were more angered by harassment than Type Bs. However, since the investigators did not evaluate the degree of competition which may be interpreted as a form of aggression during the game and did not assess whether Type As were more angered than Bs by harassment it is difficult to draw firm conclusions. On the basis of existing research, one can argue that prior frustration and/or harassment are powerful stressors in eliciting A/B differences in anger and aggression. However, the questions of 1) whether prior frustration leads to A/B differences in physiological arousal and 2) whether harassment leads to A/B differences in aggression in addition to increased physiological arousal remain to be answered.

In a study relevant to the first question, Zurawski and Houston, (1983) examined the physiological and self-report responses to an anger inducing frustration manipulation, of JAS defined Type As and Bs. Subjects worked on an Etch a Sketch task with a confederate in an attempt to gain a prize. In the frustration condition, subject's effort to gain the prize was thwarted whereas in the no frustration

condition the confederate co-operated with the subject. The examination of physiological responses (BP and GSR) and the self-report measures (MAACL) indicated the manipulation was successful. Thus, frustrated subjects had higher blood pressure and skin resistance and higher overall scores on the MAACL compared to non-frustrated subjects. However, the analyses of the data after the frustration manipulation indicated only a significant A/B main effect for skin resistance suggesting Type As were more aroused than Type Bs. No other main effect or interaction reached statistical significance leading the researchers to conclude that Type As were not more angered than Type Bs. Based on these results it was argued that the JAS may not be adequately measuring the hostility component of Type A behaviour pattern and this may account for the results. Although this argument is a possibility, considering that items assessing hostility are underrepresented in the JAS (Matthews, 1982) and the low correlations of the JAS with physiological responses, there is also the possibility that these results may be due to some other factors such as the task, given other studies such as Carver and Glass' (1978) which found significant A/B differences in behavioural measures after frustration using the JAS to classify the subjects. It seems that in Zurawski and Houston's study the task demands were such that despite frustration it was beneficial for subjects to behave cooperatively with the confederate especially when there was a prize involved. In order to cooperate with the confederate it is possible that the subjects needed to suppress hostility. Under such conditions it would seem there should be an increase in physiological arousal and the results of the GSR are in this direction whereas for the question of

the other physiological indices not reaching significance several arguments can be made.

First, the task may be perceived as too easy or too difficult by the Type As which may lead to beliefs of overcontrol or undercontrol which will mask physiological arousal. The literature suggest that A/B differences in arousal usually occur with intermediate task difficulty. Second, with tasks which involve movement cardiovascular indices may not be the best assessment technique in that the main function of the cardiovascular system is the distribution of the blood to the organ systems and when there is a high degree of activity involved in a task the expected difference in physiological arousal due to the task may be overruled by the arousal due to activity. In such cases measures like GSR may reflect sympathetic arousal more accurately which may be the case in Zurawski and Houston's (1983) study. Accordingly, one should investigate the responses of Type As in a situation that is moderately challenging in which it is beneficial for them to cooperate despite frustration producing elements in the situation.

In another study (Strube, Turner, Cerro, Stevens and Hinchey, 1984) the behaviour of Type As and Bs was investigated in a situation in which they experienced task frustration and demands of the situation did not have a direct consequence over the subjects' performance. In other words, in this study which used Buss teacher learner paradigm teaching the confederate a concept using positive or negative feedback had no direct effect on the subject but possibly an indirect effect by satisfaction through success in the teacher's role

as well as the possibility of gaining a prize by being a good teacher. Subjects were classified on the basis of the JAS as Type As or Bs and were assigned to either one of two conditions, frustration by being unsuccessful in solving a puzzle or no frustration. Then they were asked to teach a confederate concepts in the Buss teacher-learner paradigm in one of the two feedback situations. In the partial feedback situation, subjects were allowed to transfer the numerical value of the reward to the confederate but were not allowed to transfer the numerical value of a fine when the confederate was wrong. In other words, the magnitude of fines had no extrinsic value in helping the confederate learn. In the full feedback situation subjects were allowed to transfer the value of both the rewards and the fines. In the latter condition feedback may have had a value in helping the confederate learn. The analysis performed on the first ten trials in which the confederate was wrong in both conditions in the full feedback conditions indicated frustrated Type Bs did not use fines greater in magnitude than nonfrustrated Type Bs, and frustrated Type As showed a decrease in the magnitude of fines compared to nonfrustrated Type As. In contrast to the full feedback situation, in the partial feedback situation it was found that frustrated Type As used high magnitude of fines than nonfrustrated Type As whereas there was no significant difference among the Type Bs. These results indicate that prior task frustration could lead to more aggression in Type As as compared to Type Bs when the utilization of fines will not help the confederate to learn (i.e., hostile aggression in that it is aimed to hurt another individual).



The study by Strube et al., (1984) is in line with the Carver and Glass (1978) study and provides further evidence that frustration is a powerful stressor to lead Type As to behave more aggressively. Furthermore, it adds to Carver and Glass's study that there are situational determinants which may lead or inhibit aggression as it may be the case in Zurawski and Houston (1983) study. Nevertheless, there are some problems in Strube et al.'s study which were addressed in another study by Check and Dyck, (1986). First of all as argued by Check and Dyck, (1986) there was no direct evidence indicating Type As were behaving aggressively out of the desire to hurt the confederate and secondly the confederate was not responsible for the prior task frustration. Therefore, Check and Dyck, (1986) used rejection by the confederate instead of the prior task frustration used in Strube et al.'s (1984) study. In addition the instructions in the Check and Dyck study made it clear to the subjects that negative feedback interferes with learning. In other words, subjects were aware that if they increased the magnitude, of the negative feedback this would not help the learner. The researchers in this study also assessed the motives of the subjects for aggressing by including a questionnaire at the end of the experiment.

As in Strube et al.'s (1984) study, Check and Dyck (1986) classified subjects as Type As or Type Bs on the basis of the JAS. The paradigm used to measure aggression was a modified version of the ESP procedure (Malamuth, 1983). In this procedure subjects are asked to send numbers by ESP to the confederate who will try to guess these numbers. The subject's job is to provide feedback to the confederate

for their response. The subjects in this study who were angered by the confederate prior to the task by a negative evaluation written by the confederate, were asked to use monetary points in one condition and noise in another condition to give feedback to the confederate during the ESP task. Subjects were informed in the instructions that the negative feedback interferes with the task. Results of the study indicated that level of punishment delivered to the confederate correlated significantly with the reported desire to hurt the confederate assessed by the post experimental questionnaire in both conditions (monetary points or noise). This suggests that punishment level is associated with hostile aggression. Furthermore, it was found that Type As behaved more aggressively and also reported more desire to hurt the confederate in comparison to Type Bs. This study clearly demonstrates that Type As tend to resort to hostile aggression more so than Type Bs. However since prior task provocation was not manipulated one can only speculate that provocation may be the basis of the observed hostile aggression in the study and this needs to be investigated empirically. Furthermore, in Check and Dyck's (1986) study as well as Strube et al.,'s study the subjects use of larger magnitudes of fines had no direct consequence for them. In other words, the subjects had nothing to lose personally if they resorted to using larger magnitudes of fines when the confederate guessed wrong. The nature of the task was also based on guessing. Thus, when the confederate guessed wrong most of the time, it did not reflect much on the competence of the subject. In other words, subjects knew that negative reinforcement might interfere with the task but there was not all that much to do other than reducing the negative reinforcement

magnitudes to succeed in the ESP task for after all it was presented as a guessing task. This situation may enhance the subject's position that he had nothing to lose personally if he resorted to using higher magnitudes of fines.

On the other hand, in real life situations it is rare that individuals when provoked can resort to hostile aggression without having personal consequences. Frequently in real life situations people may be provoked but because of either real or imagined personal consequences involved in resorting to aggression they may be inhibited in their behaviour. In other words, Type As who showed hostile aggression when there were no personal consequences attached to the behaviour may not necessarily do so in a situation which implies personal consequences. Therefore, as an extension of Check and Dyck's (1986) and Strube and et al.'s (1984) study, it is necessary to evaluate hostile aggression observed in Type As in these studies, in a situation where Type As and Type Bs are provoked but there are personal consequences attached to resorting to aggression

Glass and et al.'s (1980) study suggests that when provoked by harassment by the confederate Type As show more physiological arousal during a competitive game compared to Type Bs. Both Strube et al.'s (1984) and Check and Dyck's (1986) study as well as Carver and Glass' (1978) study which studied aggression in Type As directly did not use any physiological measures. An argument which has been made in the literature by several researchers such as Wolf, (1971), for the high prevalence of CHD despite increased technology and knowledge about diseases is that the structure of the most societies at present

inhibits certain behaviours. The events which may lead to these behaviours, however, may be present more so than the past. Thus, the events which lead to arousal prepares the individual to respond actively (fight/flight) but the individuals most of the time can not engage in such responses and must inhibit behaviour, leading to an exaggerated cardiovascular response. According to these researchers, this exaggerated cardiovascular response in the long run may predispose individuals to CHD by hypertension and/or atherosclerosis. From this point of view, Wolf considers CHD as a price that we pay for 'civilization'.

Although Wolf's argument in associating CHD with 'civilization' is highly speculative, physiological studies as well as research in catharsis is in line with this speculation. Thus, while due to the mediating variables involved it is more complex than merely the simple opportunity of expressing anger determining physiological arousal, catharsis research (eg, Hokanson, 1961; Hokanson, 1962; Hokanson and Burgess, 1962; Hokanson, Burgess and Cohen, 1963; Van Egeren, Abelton, and Thornton, 1978) suggests that when provoked individuals are given the opportunity to aggress, the physiological arousal as a result of provocation decreases in comparison to individuals who are not given this opportunity. Instead, such physiological arousal is maintained in individuals who can not express anger behaviourally.

In line with these studies one can speculate that Type As relative to Type Bs are more sympathetically aroused in certain situations, such as when there is a threat to their self-esteem in comparison to Type Bs and may engage in aggressive behaviours.

However, when this aggressive behaviour has personal consequences Type As may inhibit this behaviour which will lead to an exaggerated and prolonged physiological arousal in comparison to Type Bs.

Furthermore, because of the Type A characteristics Type As may experience a higher frequency of such incidences than do Type Bs which may put them at a higher risk to develop CHD.

### The Purpose of the Study

The main purpose of this study was to investigate the relation of behavioural aggression and physiological responses to each other in Type A and B individuals and to evaluate the extent to which such responses are mediated by provocation and conflict. The design of the study was 2x2x2 factorial design with behaviour pattern (Type A, Type B), provocation (negative evaluation, neutral evaluation) and the situation (conflict, no conflict) being the independent variables.

The paradigm used was the Buss teacher-learner paradigm using noise as feedback. The task was a concept formation task perceived as difficult by most subjects. The subjects were asked to teach the confederate the concepts by using noise for the incorrect responses and points for the correct responses. In both situations (conflict, no conflict) the subjects were told that negative feedback might interfere with learning. Furthermore, in the conflict situation the subjects were instructed that in the second phase of the experiment the teacher would reverse roles with the learner. It was expected that these instructions would create conflict in using intense noise

since the subjects could expect retaliation from the confederate. Due to the assumption that the expectancy of punishment (presence of punishment cues) may inhibit aggressive behaviour, the conflict was enhanced by instructing the subject that there would be a valued reward for the best learner among them. It was expected that this would create a conflict in that on the one hand the subject can expect retaliation from the confederate and on the other hand will desire to earn the reward by being the better learner.

In the no conflict situation, the subjects were told that they would be the learner in a second session with another teacher. Thus, the expectancy of being in the learner's position was the same as in the conflict situation but the possibility of retaliation by the confederate did not exist. As in the conflict condition the subjects in this condition were told that the best learner among the two of them would earn a valued reward.

The dependent variables measured in the study were aggressive behaviour defined as the noise intensity and the duration used for incorrect responses self-report measures of affect, self-report measure of the subject's motives in the experiment as well as physiological measures of heart rate, systolic blood pressure and diastolic blood pressure.

## Hypotheses

### Hypotheses for behavioural aggression

- 1) Type As would use higher intensities of noise for incorrect responses in comparison to Type Bs.
- 2) Provoked subjects would use higher intensities of noise for incorrect responses in comparison to non-provoked subjects.
- 3) The subjects in the no-conflict situation would use higher intensities of noise for incorrect responses in comparison to subjects in the conflict situation.
- 4) Type As would use higher intensities of noise for incorrect responses when provoked in the no-conflict situation than Type Bs.

### Hypotheses for self-report measures of affect (MAACL)

- 1) Type As would report more anger and hostility than Type Bs.
- 2) Provoked subjects would report more anger and hostility than nonprovoked subjects.
- 3) The subjects in the conflict situation would report more anger and hostility than the subjects in no-conflict situation.

4) Type As would report more anger and hostility when provoked in the conflict situation than provoked Type Bs in the conflict situation.

Hypotheses for self-report measure of motivation to hurt

1) Type As would report more desire to hurt the confederate than Type Bs.

2) Provoked subjects would report more desire to hurt the confederate than non-provoked subjects.

3) The subjects in the no-conflict situation would report more desire to hurt the confederate than the subjects in the conflict situation.

4) Type As in the no-conflict situation who are provoked would report more desire to hurt the confederate than Type Bs under the same circumstances.

Hypotheses for physiological measures

1) Type As would show more physiological arousal as indexed by increase in blood pressure and heart rate than Type Bs.

2) Provoked subjects would show more physiological arousal than non-provoked subjects.



3) The subjects in the conflict situation would show more physiological arousal than the subjects in the no-conflict situation.

4) Type As in the conflict situation who are provoked would show more physiological arousal than Type Bs in the same situation.

## METHOD

Subjects

Subjects were 107 volunteer, male students recruited from Introductory Psychology classes at the University of Manitoba. During the first session of the study, after obtaining informed consent all subjects were given a health questionnaire, several self-report measures and the Structured Interview to classify Type A behaviour. On the basis of the health questionnaire developed for the purposes of this study (see Appendix A) and taking blood pressure and heart rate readings all subjects, except one, were judged to be in good health and were invited to participate the second session of the study (ie.the experiment). During the second session, 8 subjects had to be dropped due to equipment problems (N=3) and the detected suspiciousness revealed during the post-experimental interview about the purpose of the study (N=5). On the basis of the Structured Interview, of the remaining 97 subjects 55 were classified as Type As and 42 were classified as Type Bs. Their age ranged from 17 to 48 years (Mean=19), weight ranged from 110 to 225 lbs. (Mean=165) and height ranged from 5ft 6 inches to 6 ft 5 inches (Mean=5 ft 8 inches). All subjects except two reported engaging in some form of exercise (Mean=4 times a week). All subjects received experimental credit hours for their participation.

## Measures

The Structured Interview The student form of the SI which was utilized in this study, consists of a total of 22 questions which evaluate the competition, hostility and time urgency components of the TABP. The interview ratings are based both on the content of the answers and the stylistics (eg, posture, tone of voice, potential for hostility). Based on the interview ratings subjects can be categorized into one of five types: A-1, A-2, X, B-3, and B-4. The Type A-1 represents an individual who exhibits extreme time urgency, competition, and hostility. The Type A-2 though similar to Type A-1 in terms of behaviour represents an individual who exhibits moderate degree of time urgency, competition and hostility whereas Type B-3 and Type B-4 categories describe individuals who relatively lack time urgency, competition and hostility. The Type X ,category which defines 10% of the population on the other hand, represents individuals who exhibit both Type A and Type B characteristics equally. The SI as an assessment technique of the TABP has been used in many studies and it has good reliability and validity.

In this study the interviews were conducted by the author who was trained by D.Dyck who in turn was trained by R.Rosenman. The taped interviews were rated by two trained raters (N.E. & D.D.) at the end the study. The interrater reliability was calculated to be 80.43% in the first instance (n=44). Subjects who were rated as Type As or Type Bs by both raters independently were classified as Type As and Type Bs respectively. The disagreements were resolved by rating the tapes second time together which increased the interrater reliability to

95.65%. The interviews on which an agreement could not be reached were discarded (n=2).

Self-report measures During the experiment subjects were administered several questionnaires. They are described below.

A) Multiple Affect Adjective Check List (MAACL)

The MAACL (Zuckerman and Lubin, 1965) is a self-report measure consisting of 132 adjectives that subjects check as descriptive of current (state scale) or general (trait scale) feelings. The MAACL has three subscales, hostility, anxiety and depression. The internal reliability of the scales, range between .72 and .92 for the university students (Zuckerman and Lubin, 1965). The test-retest reliability coefficients over a 7-day period indicate low and occasionally moderate reliability for university student population [ $r$  (range) = .15 - .68]. However, the test-retest reliability for psychiatric patients over the same time period indicate significantly high correlations [ $r$  (anxiety) = .77,  $r$  (depression) = .79,  $r$  (hostility) = .84]. Thus, given the fact that most people in normal population fluctuate in mood more so than a psychiatric population it can be concluded that MAACL has test-retest reliability. Studies in the context of examination anxiety, hypnotically induced anxiety, perceptual isolation, stage fright, arousal inducing movies in addition to clinical studies and drug studies (see Zuckerman and Lubin, 1965) indicate validity of the MAACL.

#### B) Expectations Questionnaire

This measure developed in the context of this study is a 7 item 7 point scale measuring the expectations of the subject related to the task and the learner.

#### C) Motivation Questionnaire

This measure similarly developed in the context of this study consists of 14 items on a 7 point scale measuring attributions and intentions of the subject.

In addition to these measures two other scales were used for the provocation manipulation.

#### D) Survey of Attitudes

The Survey of Attitudes (Bryne, 1971) is a 56 item questionnaire measuring attitudes on a variety of issues. The reliability and the validity of the instrument has been shown in a variety of studies in the context of the attraction paradigm (Bryne, 1971). For the purposes of this study 5 items were selected from this instrument.

#### E) Interpersonal Judgement Scale (IJS)

This measure developed in the context of the attraction paradigm (Bryne, 1971) consists of the evaluation of another person on 6 questions, the continuum ranging from highly negative to highly positive on a 7 point scale.

## Equipment

### A) Whittaker Pulse Watch

Heart rate was measured continuously during the experiment by a Whittaker Pulse Watch interfaced with a computer sampling signals every five seconds. The signals were picked up by a transducer attached to the middle finger of the subject's nondominant hand and be transferred to the computer.

### B) Amerrec-160 Vital Signs Monitor

The blood pressure measures were taken by this instrument using event sampling during the base line and the structured interview. The blood pressure of the subject was measured at the beginning and at the end of the relaxation and at four different points during the interview. This gave 5 sample points for the interview. During the experiment blood pressure was again measured using an event sampling. Measures were taken at the beginning and the end of the relaxation, after provocation, after the task and at the end of the study.

## Experimental Task

The task required subjects to learn a concept. The concept to be learned was the rule or the formula in various arithmetic and geometric series which would predict the next number occurring in the series. For example, 2, 5, 6, 9 is such a series in which the numbers increase by adding 3 and 1 in succession to the numbers. The learner was expected to predict the next number occurring in the

series (10 in this case), by inducing the rule governing the serial pattern.

The task consisted of 15 series. The subject was asked to present these series one by one to the confederate and to give positive and negative feedback to the confederate. If the answer was correct the subject was told to give positive feedback (ie, points) whereas if the answer was incorrect the subject was told to give negative feedback (ie, noise). The subjects therefore did not choose type of feedback but rather levels of positive or negative feedback. The answers of the confederate were predetermined by the experimenter such that 10 out of 15 times the answers were wrong.

#### Procedure

The study was conducted in two sessions. In the first session, the subjects were informed that the research involved studying the relationship between life styles and physiological functioning and that he would be interviewed regarding his life style, given several questionnaires to complete and that his heart rate and blood pressure would be monitored. During this session, after obtaining informed consent each subject was first asked to relax for 15 minutes listening to a relaxation tape. The relaxation script was used in another study (Janisse, Edguer and Dyck, 1986) and was found to be effective in inducing relaxation. At the beginning of the relaxation session blood pressure was recorded and the transducer to monitor heart rate continuously was attached to the middle finger of the subject's

nondominant hand. Then the subject was left alone for 15 minutes to relax listening to the tape recorded relaxation script. This 15 minutes period of relaxation served as an experimental baseline. At the end of the relaxation period subject's blood pressure was recorded again.

In the second stage of this session, the subject was given the Structured Interview for the classification of Type A behaviour. Once again the subject's blood pressure was recorded at the beginning of the interview and from there on at specific points of the interview using event sampling. Heart rate was recorded continuously. The subject's responses to the interview were tape recorded.

In the final stage, the subject was given several questionnaires of interest to be completed. After the completion of the questionnaires, the subject was given experimental credit for his participation and an appointment was made for the second session, which was presented to the subject as an independent project from the first one related to learning.

In the second session, the participants were the subject and the confederate who was an undergraduate psychology student trained to role play the 'learner' in this experiment. Upon arriving to the laboratory, the subject was introduced to the confederate who posed as a fellow student participating to the experiment. First the subject and the confederate were given a brief introduction to the experiment in which they were told that the researchers are interested in studying the relationship of physiological arousal to learning. In



the context of the Buss teacher-learner paradigm, the subject and the confederate were informed that there would be a teacher and a learner in this experiment and that the teacher would be asked to teach concepts to the learner. The subject then, was told that on the basis of the participation sequence to the experiment the subject would be the teacher the first time around.

After this brief introduction the subject and the confederate were left alone in the room for a few minutes as the experimenter checked the equipment in the adjacent room. During this short period, the confederate was asked to converse with the subject on the basis of the arranged script and depending on the condition which the subject was assigned to with regard to the provocation variable, either to present as an unfriendly or a friendly person, to create consistency with respect to the behaviour of the confederate in the later portion of the experiment.

The subjects were randomly assigned to one of the four conditions of the experiment. These conditions were created by the manipulations of provocation and conflict as described below.

Provocation-conflict. The subjects in this condition were presented with an attitude questionnaire supposedly completed by the confederate but actually completed by the experimenter on the basis of the subject's attitude questionnaire such that there was 80% disagreement between the attitudes of the subject and the confederate. In addition to this disagreement, subjects received the standard negative evaluation and the negative Interpersonal Judgement

Scales from the confederate. The conflict manipulation, consisted of the instruction that a) negative feedback might interfere with learning b) that the subject would change places with the learner (ie, confederate) in the second phase of the experiment c) the person with the better performance would receive a valued reward.

Provocation-no conflict. The subjects in this condition were presented with the 80% disagreement attitude questionnaire followed by the standard negative evaluation and the Interpersonal Judgement Scale as reflecting the impressions of the confederate of them, as in the first condition. However, the conflict manipulation was deleted by telling subjects that in the second phase of the experiment a new subject would become his teacher.

No provocation-conflict. The subjects in this condition were presented with an attitude questionnaire reflecting 80% agreement between the attitudes of the subject and the confederate on the issues presented in the Attitude Questionnaire. In addition to this agreement subjects received the standard neutral evaluation and the Interpersonal Judgement Scale as reflecting the impressions of the confederate of them. The instructions subjects received for the task was the same as the second condition.

No provocation-no conflict. The instructions subjects received in this condition for the task were the same as the first condition however, unlike the first condition subjects were presented with the attitude questionnaire reflecting 80% agreement between the subject and the confederate and received the standard neutral evaluation and

the Interpersonal Judgement Scale as reflecting the impressions of the confederate of them.

The experiment was carried in the following order. After the experimenter's return to the research room, subjects were presented with the tape recorded instructions that they would be asked to relax for 15 minutes in separate rooms listening to a relaxation tape, followed by the experiment. Following these instructions, the confederate was taken to another room, the subject's blood pressure was recorded and after the attachment of the heart rate monitor to the subject the relaxation session was started. During the relaxation stage, the subjects listened to the relaxation tape in a quiet room and tried to relax. At the end of the relaxation, the subject's blood pressure was again recorded.

After this period of relaxation to obtain an experimental baseline of physiological activity, the subjects were given the shortened version of the Attitude Survey (Bryne, 1971) supposedly reflecting the confederate's attitudes. The stated rationale for the exchange of attitudes was that this variable was known to influence the learning process. The subjects were asked to write an evaluation of the confederate and complete the Interpersonal Judgement Scale on the basis of their impressions and the confederate's attitudes, to be exchanged between them. Subjects in the provocation conditions received an attitude questionnaire disagreeing 80% with their attitudes while the subjects in the no provocation conditions received an attitude questionnaire agreeing 80% with their attitudes.

After the subject completed his evaluation, the evaluations were exchanged. Subjects in the provocation conditions received a negative evaluation and a negative Interpersonal Judgement Scale, while subjects in the no provocation conditions received a neutral evaluation and Interpersonal Judgement Scale. At this point the subject's blood pressure was recorded again and following this the Multiple Affect Adjective Check List (MAACL), (Zuckerman & Lubin, 1965), and the Expectations Questionnaire were administered with the rationale that mood and expectations are known to be two other factors affecting learning. The subject and the confederate in separate rooms, were then given condition specific instructions about the task. After the task was clear to the subject, he was left alone to serve as a teacher in administering positive feedback (i.e., points from 1 to 7) to correct and negative feedback (i.e., noise from 1 to 7) to incorrect responses generated by a preprogrammed computer. When the 15 series creating the task were completed the subject's blood pressure was recorded again and the MAACL and the Motivation Questionnaire were administered. After the completion of these questionnaires, the subject was interviewed by the experimenter in regard to the experiment and was administered a post-experimental questionnaire. Then the subject was debriefed and given experimental credits for the experiment.

## RESULTS

The data for each of the dependent variables were analyzed by analyses of variance (ANOVA) and post hoc comparisons using Dunn's procedure (Dunn, 1961). In this section, the results will be presented in the context of the hypotheses of the study. The significance level was set at  $p < .05$ , but the results at probabilities of  $p < .10$  will also be reported.

### Behavioural Aggression

#### Noise Level

The analysis was a  $2 \times 2 \times 2 \times 10$  repeated measures factorial design with Type A behaviour, provocation and conflict as factors for the levels of noise selected by the subjects. The analysis indicated that provoked subjects used significantly higher levels of noise than did nonprovoked subjects.  $F(1,89)=13.61$ ,  $p < .004$ . There was also a significant interaction between behaviour type and noise levels selected over the 10 incorrect responses,  $F(9,783)=1.91$ ,  $p < .04$ . A  $2 \times 2 \times 2 \times 5$  analysis of the first five trials and the last five trials indicated that Type Bs showed a tendency to use higher levels of noise during the first five trials,  $F(1,89)=3.85$ ,  $p < .05$ . This effect can be seen in Figure 1.

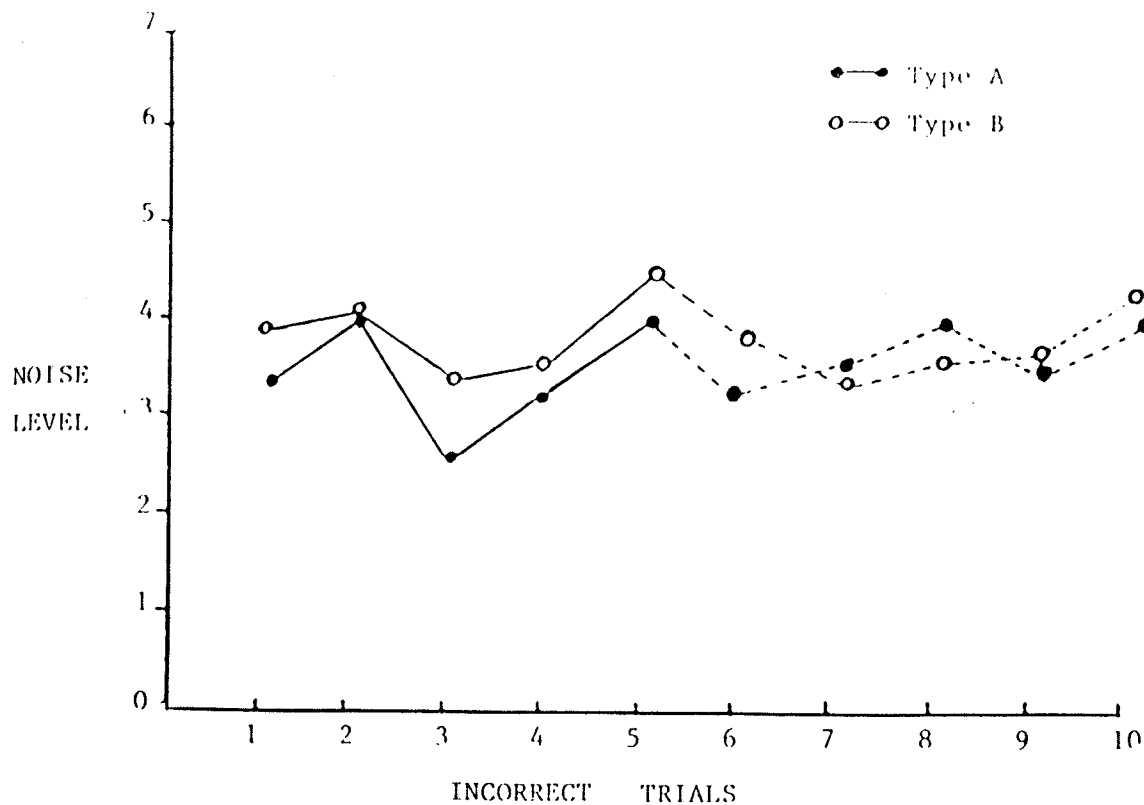


Figure 1. Noise levels selected by Type A and Type B subjects over trials.

#### Noise Duration

Subjects in the conflict condition used significantly longer durations of noise than did subjects in the no-conflict condition,  $F(1,89)=3.75$ ,  $p < .05$ . A significant provocation by trials interaction showed that, provoked subjects used longer durations of noise over trials in comparison to non-provoked subjects,  $F(9,801)=2.02$ ,  $p < .034$ . A significant behaviour type by provocation by trials interaction ( $F(9,801)=2.89$ ,  $p < .002$ ) indicated that nonprovoked Type As used shorter durations of noise over time in comparison to other groups. This interaction is shown in Figure 2.

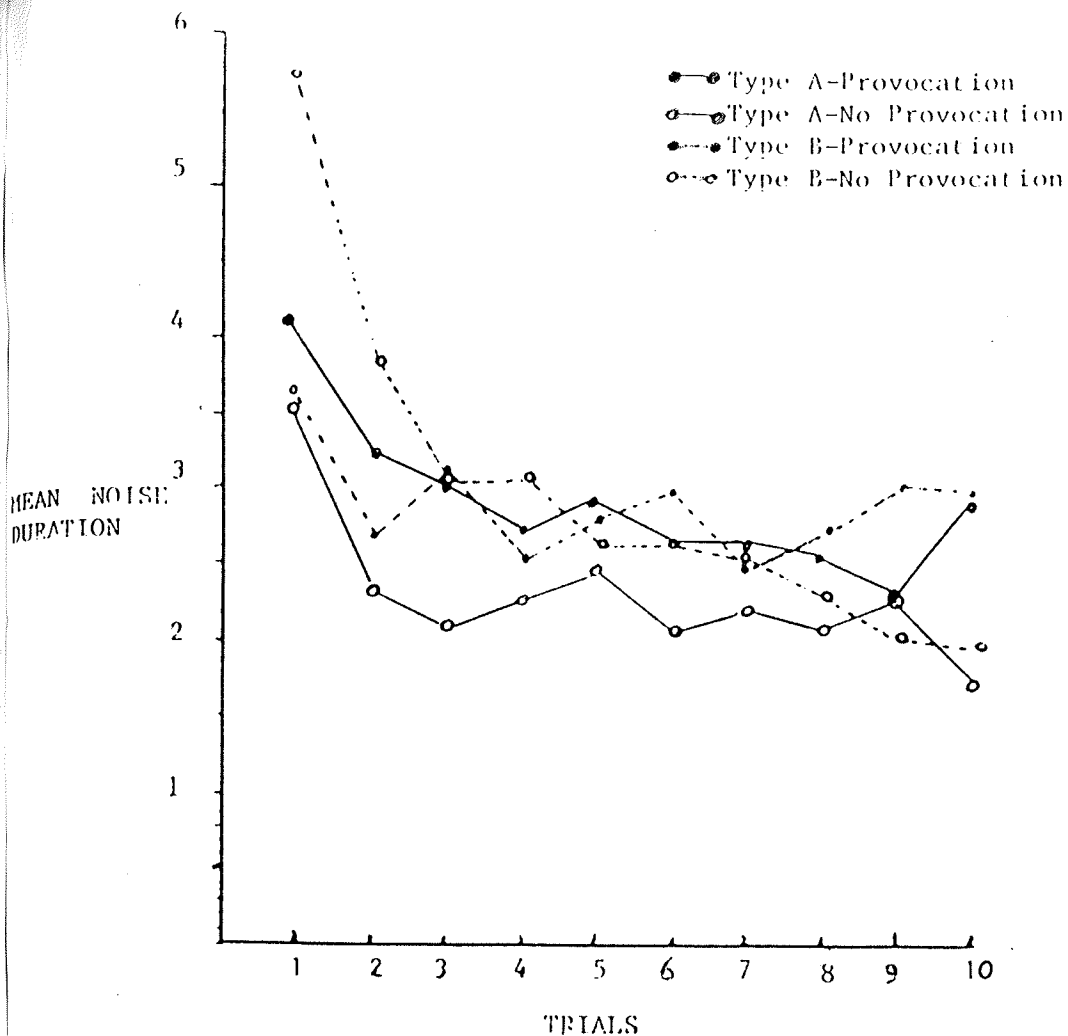


Figure 2. Noise duration as a function of behaviour type, provocation and trials.

This interaction described between provocation, behaviour type and trials was also influenced by conflict, as indicated by a significant interaction between behaviour type, provocation, conflict and trials. ( $F(9,801)=2.07, P<.029$ ). The nonprovoked Type As in the conflict condition used significantly shorter durations of noise in comparison to the other groups in the conflict condition.

Table 1  
Means and standard deviations (in parentheses) of noise duration  
(seconds) as a function of behaviour type

	<u>Type A Behaviour</u>		<u>Type B Behaviour</u>	
	<u>Provocation</u>	<u>No provocation</u>	<u>Provocation</u>	<u>No provocation</u>
<u>Conflict</u>	<u>3.44</u> (2.36)	<u>2.13</u> (0.83)	<u>3.40</u> (2.39)	<u>3.21</u> (2.71)
<u>No conflict</u>	<u>2.46</u> (1.10)	<u>2.48</u> (1.80)	<u>2.39</u> (1.14)	<u>2.57</u> (1.43)

As can be seen in Table 1, Type B subjects in the conflict conditions used longer durations of noise than in the no conflict condition regardless of whether they were provoked. Type As, on the other hand, increased noise under conflict only when they were provoked. Thus, for Type As both conflict and provocation had to be present in order to increase aggression whereas for Type Bs conflict alone was a sufficient condition for increased aggression.

#### Point Levels

There was a tendency ( $F(1,89)=3.22, p < .07$ ), for provoked subjects, relative to nonprovoked subjects to use lower levels of points to correct responses.



### Self-report measures of affect (MAACL)

A 2 x 2 x 2 x 2 factorial ANOVA with behaviour type, provocation, conflict, and time as the factors was used to analyse the data from each of the three scales of the MAACL.

#### Hostility

Provoked subjects reported significantly more hostility in comparison to nonprovoked subjects,  $F(1,89)=20.18$ ,  $p < .0001$ . There was a tendency ( $F(1,89)=3.46$ ,  $p < .06$ ), for Type As to report more hostility in comparison to Type Bs.

#### Depression

Provoked subjects reported significantly more depression in comparison to nonprovoked subjects,  $F(1,89)=12.83$ ,  $p < .00$ . Type As reported significantly more depression than Type Bs,  $F(1,89)=4.42$ ,  $p < .03$ .

#### Anxiety

Provoked subjects reported significantly more anxiety in comparison to nonprovoked subjects,  $F(1,89)=14.09$ ,  $p < .0003$ . Also, a significant interaction was found with respect to anxiety over time for the provocation variable,  $F(1,89)=5.52$ ,  $p < .02$ . As can be seen in Figure 3, while there was a decrease in the reported anxiety of the

provoked subjects over time, there was a slight increase in the reported anxiety of the nonprovoked subjects.

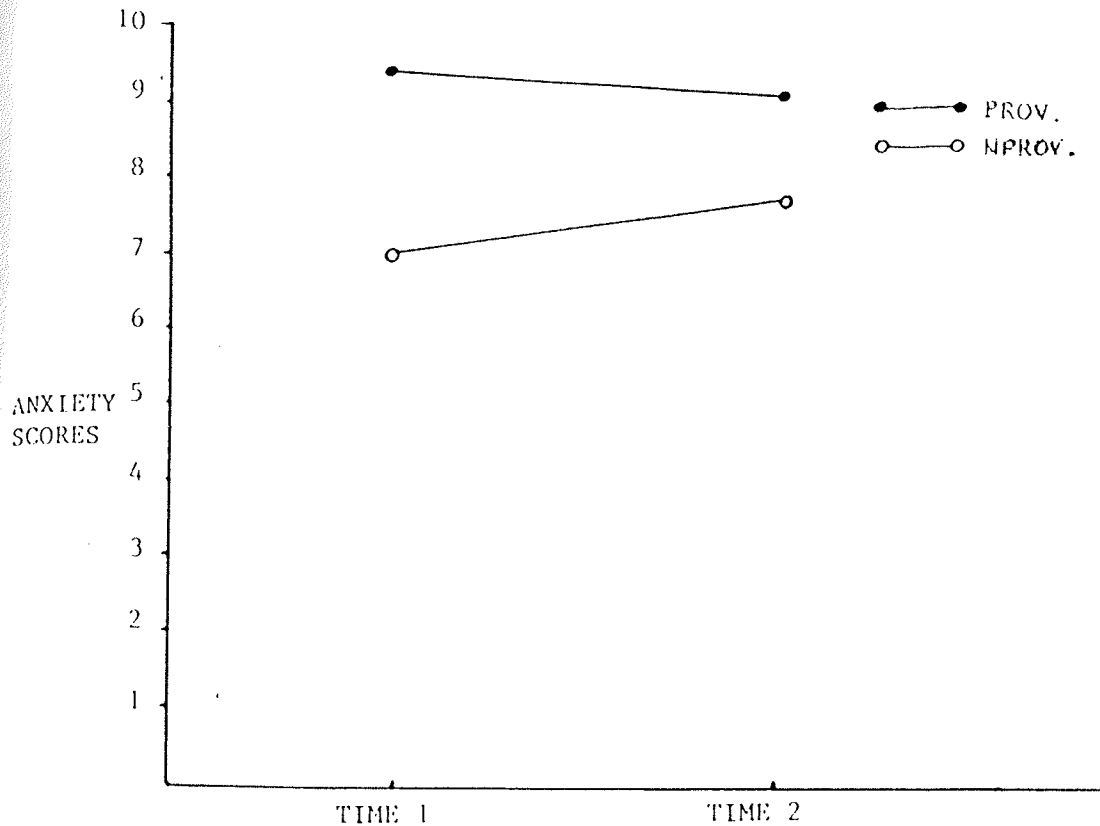


Figure 3. Anxiety scores over time as a function of provocation.

#### Causal Expectations

A 2 x 2 x 2 analysis revealed that Type As relative to Type Bs reported luck being more important in a learning situation than Type Bs,  $F(1,89) = 5.23, p < .03$ . Furthermore, there was a tendency for Type As to report task ( $F(1,89) = 3.08, p < .08$ ) and ability ( $F(1,89) = 2.62, p < .10$ ) as more important a factor in a learning

situation than Type Bs. While there were no significant differences found with respect to the effort factor, there was a slight tendency for subjects in the no conflict condition to report effort to be a more important factor in a learning situation than the subjects in the conflict condition. ( $F(1,89)=2.62, p < .10$ )

In relation to the factors associated with the learner, Type As in comparison to Type Bs ascribed significantly more ability to the learner  $F(1,89)=3.75, p < .05$ . Nonprovoked subjects ascribed more ability to the learner  $F(1,89)=8.91, p < .003$  and reported that the learner would show more effort to learn, ( $F(1,89)=21.74, p < .0000$ ) and perform better on the task ( $F(1,89)=17.97, p < .0001$ ), in comparison to the subjects in the provocation condition.

#### Motivation

The data from the motivation questionnaire were analysed by using a  $2 \times 2 \times 2$  factorial design with behaviour type, provocation and conflict as the factors.

Type A subjects rated the learner's performance higher than did Type B subjects,  $F(1,89)=4.35, p < .03$ . Also, a tendency was observed in the nonprovoked subjects to report the learner's performance to be better in comparison to the provoked subjects,  $F(1,89)=7.79, p < .06$ . There were no significant differences among the groups with respect to the influence of factors related to the learner as opposed to the teacher, in the task.

The analysis of the luck variable indicated a significant interaction between provocation and conflict variables,  $F(1,89)=6.05, p < .01$ , as shown in Table 2.

Table 2

Means and the standard deviations (in paranteses) of the luck ratings as a function of provocation and conflict

	<u>Provocation</u>	<u>No provocation</u>
<u>Conflict</u>	<u>0.16</u> (0.84)	<u>1.01</u> (1.41)
<u>No conflict</u>	<u>1.85</u> (0.89)	<u>0.10</u> (1.42)

As can be seen in Table 2, subjects in the provocation-no conflict condition followed by the subjects in the no provocation-conflict condition reported luck affecting the learner's performance significantly more than the other groups, (i.e., provocation-conflict, no provocation-no conflict).

In regard to the ability and effort factors the results indicated that provoked subjects rated both the ability ( $F(1,89)=13.63, p < .0004$ ) and effort ( $F(1,89)=7.07, p < .009$ ), significantly less of a factor influencing the learner's performance in comparison to nonprovoked subjects. There were no significant differences for the task variable.

The analyses related to the utilization of points and noise by the subjects indicated a significant main effect ( $F(1,89)=5.06, p <$

.027 for points. Provoked subjects in comparison to nonprovoked subjects rated points less of a factor influencing the learner's performance, while there were no significant differences with respect to the ratings of the influence of noise on the learner's performance. The analysis revealed no significant main effects with respect to the reported freedom in using points or noise. However, a significant interaction between behaviour type, provocation and conflict ( $F(1,89)=6.82, p < .01$ ) was found with respect to the reported freedom in using noise. This interaction is shown in Figure 4.

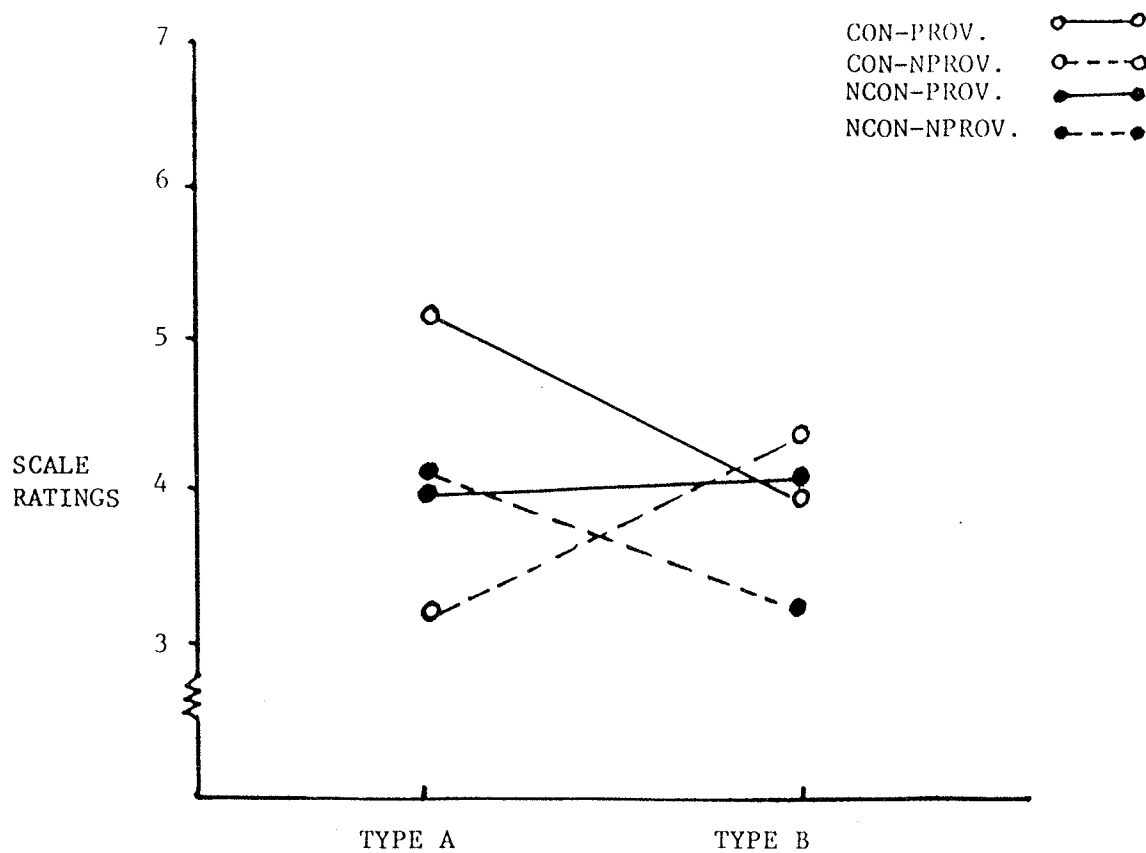


Figure 4. Mean reported freedom in using noise as a function of Type A behaviour, provocation and conflict.

As can be seen in Figure 4, among Type As, provoked Type As in the conflict condition reported the most freedom in using noise while nonprovoked Type As in the conflict condition reported the least freedom. On the other hand, among Type Bs, nonprovoked Type Bs in the conflict condition reported the most freedom similar to provoked Type As in the conflict condition.

In addition to these results, with respect to the reported utilization of points or noise to help the learner, a tendency was observed for Type As to report using points to help the learner more so than Type Bs, ( $F(1,89)=3.33$ ,  $p < .07$ ). On the other hand, regarding the utilization of points or noise to hurt the learner, a tendency was observed for the subjects in the no conflict condition to report using noise to hurt the learner more so than the subjects in the conflict condition, ( $F(1,89)=2.99$ ),  $p < .08$ ).

#### Physiological Measures

In the analyses of the physiological measures both the raw scores and the change scores were used. Change scores were computed on the basis of the difference between the experimental baseline readings and the readings taken during the experiment.

#### Systolic Blood Pressure

The data were analysed by a 2 x 2 x 2 factorial ANOVA with behaviour type, provocation and conflict as the factors. The analysis using raw scores revealed a significant behaviour type main effect for the first ( $F(1,89)=7.15$ ,  $p < .0089$ ) and the second ( $F(1,89)=3.51$ ,  $p <$

.06) systolic blood pressure readings. Type As had significantly higher blood pressure relative to Type Bs on both occasions. A provocation main effect for the first ( $F(1,89)=8.48, p < .0045$ ) and the second ( $F(1,89)=6.35, p < .01$ ) blood pressure readings indicated that provoked subjects had higher systolic blood pressure readings in comparison to nonprovoked subjects.

Furthermore, a conflict main effect for both the first ( $F(1,89)=5.57, p < .02$ ) and the second ( $F(1,89)=6.96, p < .009$ ) blood pressure readings indicated subjects in the conflict condition had higher systolic blood pressure in comparison to subjects in the no conflict condition. There was also a significant interaction between behaviour type and conflict both for the first ( $F(1,89)=3.11, p < .08$ ) and the second ( $F(1,89)=5.30, p < .02$ ) blood pressure readings. As can be seen in Tables 3 and 4, Type As in the conflict conditions had higher systolic blood pressure readings in comparison to Type As in the no conflict condition and to all Type Bs.

Table 3

Raw score means and standard deviations (in paranteses) of systolic blood pressure as a function of behaviour type, provocation and conflict: I

	<u>Type A Behaviour</u>		<u>Type B Behaviour</u>	
	<u>Provocation</u>	<u>No provocation</u>	<u>Provocation</u>	<u>No provocation</u>
<u>Conflict</u>	<u>135.84</u> (17.32)	<u>128.00</u> (12.12)	<u>123.63</u> ( 9.92)	<u>113.72</u> ( 9.32)
<u>No Conflict</u>	<u>121.92</u> (18.42)	<u>117.31</u> (15.76)	<u>123.63</u> (12.9)	<u>110.71</u> (13.38)

Table 4

Raw score means and standard deviations (in paranteses) of systolic blood pressure as a function of behaviour type, provocation and conflict: II

	<u>Type A Behaviour</u>		<u>Type B Behaviour</u>	
	<u>Provocation</u>	<u>No provocation</u>	<u>Provocation</u>	<u>No provocation</u>
<u>Conflict</u>	<u>137.15</u> (18.37)	<u>127.33</u> (13.33)	<u>125.45</u> (10.09)	<u>114.00</u> (14.68)
<u>No conflict</u>	<u>119.61</u> (15.77)	<u>115.25</u> (12.74)	<u>121.00</u> (13.46)	<u>116.42</u> (15.06)



The analysis of the systolic blood pressure data with the change scores revealed a significant main effect for provocation for both the first ( $F(1,89)=9.25, p < .003$ ) and the second ( $F(1,89)=3.69, p < .05$ ) systolic blood pressure readings taken during the experiment. The subjects in the provocation conditions showed greater increase in their blood pressure readings in comparison to the subjects in the no provocation conditions on both occasions.

Furthermore, the conflict main effect for both the first ( $F(1,89)=3.05, p < .08$ ) and the second ( $F(1,89)=2.90, p < .09$ ) systolic blood pressure readings indicated a tendency for the subjects in the conflict conditions to have greater increase in their blood pressure relative to subjects in the no conflict conditions. There was also an interaction between behaviour type and conflict for both the first ( $F(1,89)=3.57, p < .06$ ) and the second ( $F(1,89)=4.44, p < .03$ ) systolic blood pressure readings, indicating a significant increase in the systolic blood pressure of Type As in the conflict condition relative to Type As in the no conflict condition and to all Type Bs. This is seen in Figure 5.

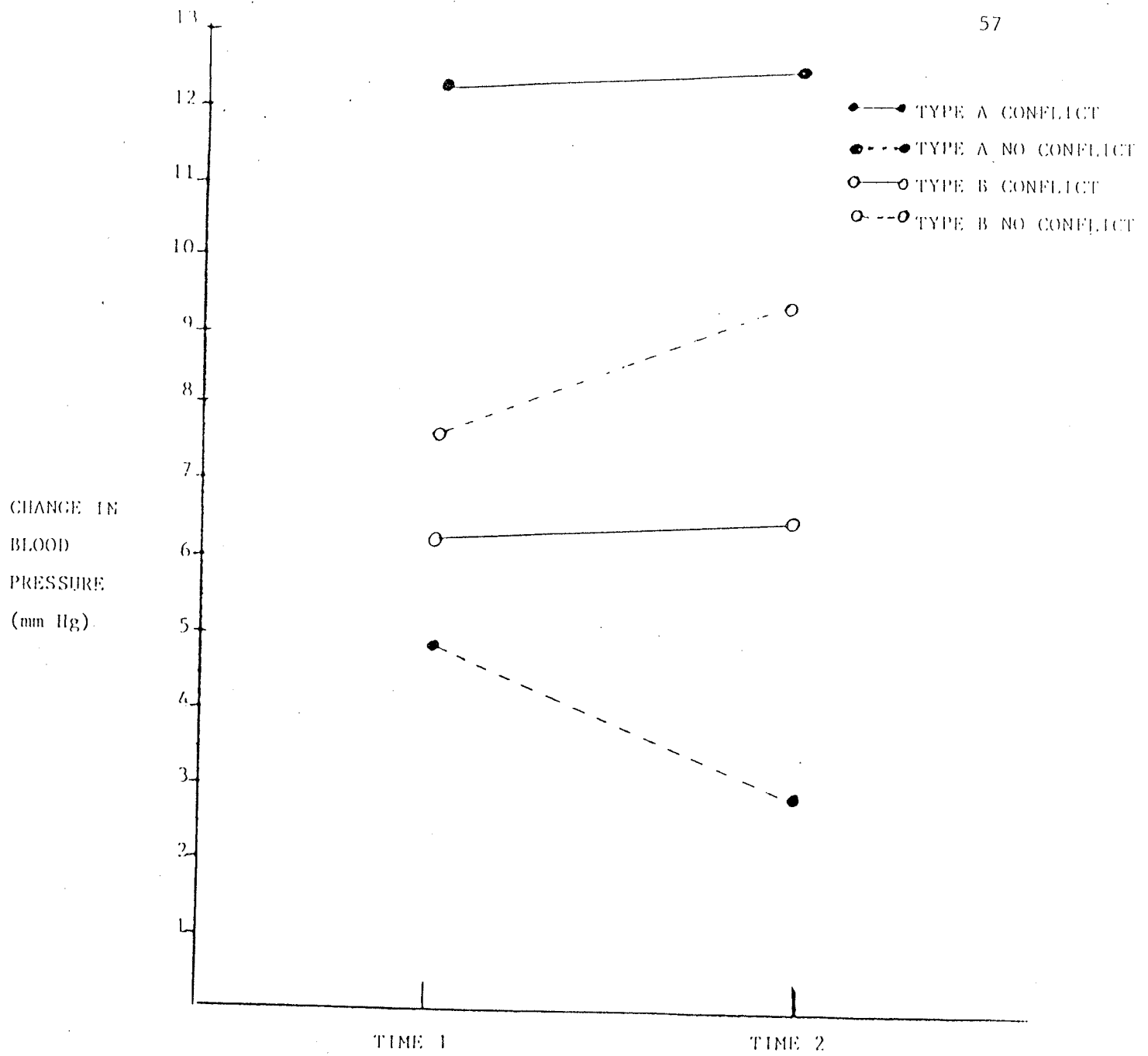


Figure 5. Mean change in systolic blood pressure as a function of behaviour type and conflict.

### Diastolic Blood Pressure

There were no significant effects with respect to diastolic blood pressure readings.

### Heart Rate

The analysis of heart rate during the relaxation period indicated no significant differences among the groups. Two separate  $2 \times 2 \times 2 \times 15$  analyses of variance with repeated measures using raw scores and change scores were conducted with behaviour type, provocation, conflict and time as the factors.

The analysis with the raw scores, indicated that Type As had significantly higher heart rate than Type Bs,  $F(1,84)=4.38$ ,  $p < .03$ . Also, there was a tendency for provoked subjects ( $F(1,84)=2.95$ ,  $p < .08$ ) and the subjects in the conflict condition ( $F(1,84)=3.11$ ,  $p < .08$ ) to show higher levels of heart rate in comparison to their respective counterparts.

In addition, there was a significant three way interaction between behaviour type, provocation and conflict, ( $F(1,84)=6.43$ ,  $p < .01$ ), which can be seen in Figure 6.

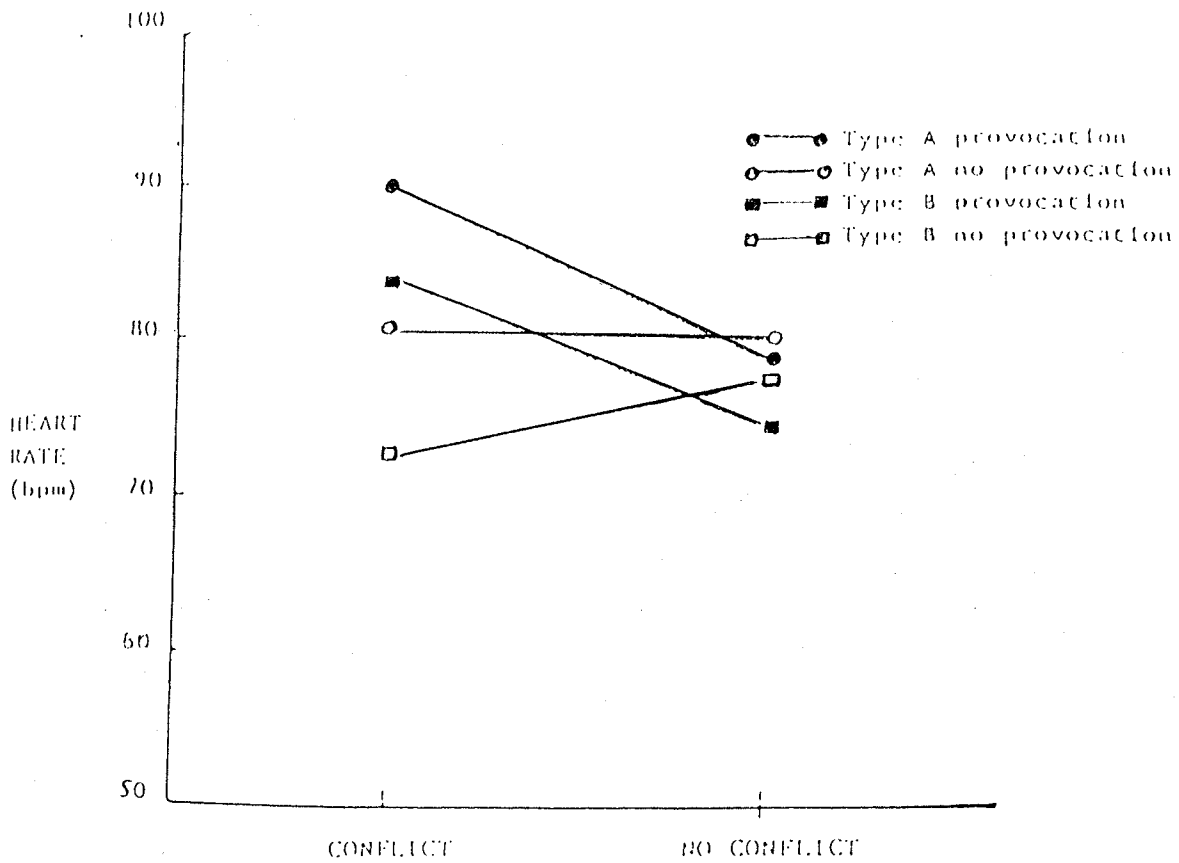


Figure 6. Raw score mean heart rates as a function of behaviour type, provocation and conflict.

As is shown, overall Type As had higher levels of heart rate but this was most pronounced under the provocation-conflict condition. On the other hand, the difference between Type As and Type Bs was most pronounced in the no provocation-conflict condition, with Type As having an average heart rate of 81 bpm and Type Bs having an average heart rate of 72 bpm, as can be seen in Table 5.

Table 5

Raw score heart rate means and standard deviations (in parentheses)

as a function of behaviour type, provocation and conflict.

	<u>Type A behaviour</u>		<u>Type B behaviour</u>	
	<u>Provocation</u>	<u>No provocation</u>	<u>Provocation</u>	<u>No provocation</u>
<u>Conflict</u>	<u>90.38</u> (18.29)	<u>81.18</u> (12.05)	<u>84.98</u> (15.36)	<u>72.06</u> (14.24)
<u>No Conflict</u>	<u>78.51</u> (11.02)	<u>80.23</u> (10.51)	<u>74.49</u> ( 9.65)	<u>77.01</u> ( 8.51)

There were no significant differences among groups with respect to trials.

The analysis with the change scores revealed a significant conflict main effect,  $F(1,81)=6.46$ ,  $p < .01$ . Subjects in the conflict condition showed a greater increase in their heart rate in comparison to subjects in the no conflict condition. There was also a tendency for the provoked subjects to show greater increase in their heart rate, ( $F(1,81)=3.05$ ,  $p < .08$ ).

## DISCUSSION

The purpose of this study was to investigate the behavioural and physiological responses of Type A and Type B individuals in a teacher-learner situation involving provocation and/or conflict, with potential negative consequences for behaving aggressively. It was predicted that provoked Type As in the no conflict condition would show more behavioural aggression, more hostility and more desire to hurt the learner than their counterparts in the teacher-learner paradigm. On the other hand, it was expected that Type A subjects who experienced both provocation and conflict would show more physiological arousal in comparison to their counterparts. The results of the study supported some of these expectations but not without several caveats.

Behavioural results indicated that Type As, relative to Type Bs did not show evidence of more behavioural aggression. In fact, in the first five trials of the task which were all negative feedback trials Type Bs relative to Type As used higher levels of noise. There was no difference between Type As and Type Bs in the second five negative feedback trials which were interspersed among positive feedback trials. In the same vein, regarding noise duration Type Bs in the conflict condition used longer durations of noise, whereas for Type As both provocation and conflict had to present to increase durations of noise. There was no difference between Type As and Type Bs in point levels given for the correct responses. These results are not consistent with the general trend in the literature which suggests that Type As behave more aggressively than do Type Bs in socially sanctioned situations such as the Buss teacher-learner paradigm.

For example, in a recent report (Baron, Russell & Arms, 1985), Type A and Type B subjects were given an opportunity to aggress against a person who previously either had provoked or not provoked them, in the presence of high, medium or low concentration negative air ions. The results of the study indicated moderate or high levels of negative ions were associated with more aggression in Type As but not in other groups. Also, Carver and Glass (1978) found that JAS defined Type As delivered more shocks to a confederate in the Buss teacher-learner paradigm in comparison to Type Bs following harassment during a difficult task. In another study using the Buss teacher-learner paradigm (Strube, Turner, et al., 1984), following frustration Type As used greater magnitude of fines in comparison to nonfrustrated Type As in a situation in which the magnitude of fines could not affect the confederate's performance. These results suggest Type As might be more aggressive than Type Bs, however, in both studies there was no direct evidence for the aggressive behaviour of Type As resulting from a desire to hurt the confederate. In an attempt to answer this question, Check and Dyck, (1986) used rejection by a confederate instead of task frustration and assessed the motives of the subjects directly. Subjects were told that the negative feedback (noise) would interfere with the performance of the confederate. The results of the study indicated that level of punishment delivered to the confederate correlated significantly with the reported desire to hurt the confederate, supporting a direct relationship between Type A behaviour and aggression.

In contrast to this general trend, there are a few studies which suggest the aggression of Type As is dependent on the situation. Thus, Type As do not always behave aggressively when provoked. For example, in a bogus learning experiment, Holmes and Will (1985) found that Type As who had not previously been angered by a confederate, gave the confederate significantly higher levels of punishment, while Type As and Type Bs who had been angered did not differ. Similarly, in the present experiment, provoked Type As did not differ from provoked Type Bs in using noise levels on negative feedback trials interspersed with positive feedback trials. However, the present study goes further in demonstrating suppression of behavioural aggression in provoked Type As and not provoked Type Bs, when administering negative feedback during consecutive incorrect responses.

Holmes and Will (1985) explained the aggression they observed in non-angered Type As as an indication of Type As' aggressive nature, while they explained the nonsignificant results of the anger condition in the context of attributions. They argued that in a performance situation Type As would internalize the blame for poor performance whereas Type Bs would externalize it. Thus, they speculated that since in the anger manipulation the subject's performance was criticized, it was likely that Type As concerned with achievement would become more self-critical and hence less aggressive toward others, whereas Type Bs would blame the confederate and hence would become more aggressive. In a study investigating attributions and aggression, Kulik and Brown (1979) found that internal



attributions lead to the least anger and other-directed aggression and to the most self-blame and self-aggression, in line with Holmes and Will's explanation. On the other hand, although integrating aggression with particular attributions is an intriguing explanation, it has not been clearly established in the literature that Type As, when experiencing failure, internalize blame. Indeed there is some evidence to suggest that Type As tend to be more self-serving in their attributions, (e.g., Strube, 1985; Janisse, Moser, Yeh, Yerama, & Dyck, 1986). Another way of explaining these contradictory results regarding aggressiveness of Type As has been offered by Baron, Russell and Arms (1985). They argued that, in general, Type As may be more aggressive than Type Bs. However, in situations in which they are provoked, they may experience strong aggressive tendencies which they perceive as inappropriate and thus, may consciously reduce their behavioural aggression.

In the present experiment, unlike Holmes and Will's (1985) study, the provocation manipulation did not involve performance. In fact, the provocation manipulation, as it came from an external agent and degraded the subject, it was more likely to increase the probability of other directed aggression. Therefore, it would be difficult to interpret the behavioural results of the present study in this context. On the other hand, Baron et al's (1985) interpretation might be applicable to the present results. Here Type As might have been more affected by the provocation manipulation and perceiving their aggressive impulses as strong might have reduced their overt aggression consciously. Another possibility, as argued by Janisse,

Edguer and Dyck (1986), might be that in an aggressive situation an angry response can be conceptualized either as a loss of control or as an attempt to gain control. If one can argue that Type As have less control in aggressive situations and they want to maintain control, a strong provocation may serve as a stimulus to inhibit aggression in order to increase control. Thus, Type As in the present experiment might have consciously reduced their behavioural aggression in order to maintain control over the situation. In addition to these possible interpretations, it could also be that the present study included a possibility of retaliation by the confederate and hence, was quite different from the settings of the other studies which found Type As to be more aggressive than Type Bs.

The results regarding the causal expectations and motivation questionnaires are in line with the suppression of behavioural aggression seen in Type As in this study. Type As, relative to Type Bs, emphasized the importance of luck and task as factors affecting learning. Although, these ratings were given before the task was introduced and therefore are not attributions but more like causal expectations, in line with the traditional attribution theory, luck and task can be considered as external factors while ability and effort can be considered as internal factors. Thus, Type As in this experiment emphasized the importance of external factors in a learning situation. They also reported the learner to have more ability before the task. Similarly, after the task Type As reported the learner's performance to be significantly better in comparison to the reports of Type Bs. These results may be interpreted in the context of coping.

The positive ratings of the confederate and the emphasis on the external factors might be strategies used to decrease the intensity of aggressive impulses. The emphasis on the external factors might shift the attention away from the learner and make positive performance ratings easier while the positive ratings may serve the purpose of decreasing the intensity of aggressive impulses. These strategies would also explain why there was no indication of overt behavioural aggression in Type As relative to Type Bs.

Although compatible with the behavioural results, these results from the expectations and motivation questionnaire are incompatible with results of the self-report measure of affect. Despite the lack of behavioural aggression in Type As, they reported more hostility and depression on the MAACL than did Type Bs. This result, however, is consistent with the Type A construct. Since one of the components of the Type A behaviour pattern is hostility, it is not unexpected that provoked Type As experience more hostility and depression. In other studies similar results have also been found. For example, in Baron et al., (1985), Type As relative to Type Bs reported more anger/hostility and dejection/depression on the Profile of Mood States (POMS). The results of the affect measures used here are also compatible with the physiological results in this study.

With regard to physiological responses, Type As had greater heart rate than Type Bs. Also, in the conflict condition Type As showed a greater change in systolic blood pressure than did Type Bs. These data are compatible with various theories of emotion conceptualizing physiological arousal as one of the components of

emotion and may be interpreted from several points of view regarding Type A behaviour. The physiological view of Krantz and Durel (1983) suggests the greater arousal observed in Type As may be physiologically mediated. Thus, Type As may have a more reactive physiological system (ie., high beta-adrenergic drive) and may show an enhanced physiological response. This argument emphasizes a physiological basis for reactivity and would imply the importance of physiological dynamics in managing Type A behaviour, as evidenced in psychopharmacological studies. For example, Schmeider, Friedrich, Neus, Rudel and Von Eiff, (1983) using beta-blockers, found that characteristics of Type A patients changed toward Type B and that beta-blockers attenuated cardiovascular reactivity. Similar results were found in another study (Krantz, Durel, Davia, Shaffer, Arabian, Dembroski and MacDougall, 1982) in which patients treated with propranolol were significantly lower in the intensity of Type A behaviour and cardiovascular responses to SI in comparison to Type A patients taking other drugs such as diuretics, nitrates. It is important to note that in this study Type A components found to be lower in the propranolol treated group included speech stylistics as well as potential for hostility. Thus, it seems the characteristics of Type A behaviour, including hostility, which may transfer itself to aggression in certain situations, may originate from a biological basis.

A different but not incompatible explanation of the enhanced physiological responses of Type As in this experiment may be seen in the context of the stressors involved. There is evidence in the

literature that the enhanced sympathetic activity of Type As is more likely to occur in situations in which there is an ego threat, such as harassment, competition, evaluation and challenge (Malcolm, Janisse & Dyck, 1984; Dembroski et al., 1978; Dembroski et al., 1979; Dembroski, MacDougall & Lushene, 1979). In the present experiment, provocation as an ego threat and the conflict conditions as an interpersonal competition situation, might have lead to an enhanced physiological response in Type As. In the same line, an alternative explanation may be Obrist's (1981) 'active coping' concept. According to Obrist (1981), coping strategies in which the organism attempts to exert control over the stressors are associated with increased sympathetic activity. In the literature it has been argued that, Type As are highly motivated to control their environment and thus are more reactive than Type Bs when this control is threatened (e.g., Glass, 1977). As noted above, the possibility exists that the lack of evidence of behavioural aggression in Type As may indicate that they were trying to control their aggression. This coping strategy may have implications at the physiological level. Although the nature of the relationship among behaviour type, controllability and physiological arousal is not clear, there is some evidence in the literature to suggest that physiological arousal in Type As may be associated with control. For example, Pittner, Houston and Spiridigliozzi (1983) found that Type As had greater systolic blood pressure in no control and consistent control conditions, relative to a moderate control condition. Similarly, Nielson and Neufeld (1986) found Type As to have lower pulse transit times (i.e., greater arousal) under conditions of uncontrollable stress than with

controllable stress. On the other hand, Van Schnijdel, De May and Naring (1984), varying the percentage of solvable anagrams, found that Type As had greater systolic and diastolic blood pressure only under the moderate control condition (50% solvable). There were no differences in the high and the low control conditions. The different tasks used in these studies may be a factor in the variability of the results, but one can conceptualize control as an important mediator of physiological arousal, more so for Type As than Type Bs on the basis of these results.

One can argue that in this experiment both the conflict and the no conflict conditions were interpersonal competition situations. Research indicates that Type As' need to control is greater than Type Bs' in interpersonal competition situations (Dyck, Moser, & Janisse, In press). It may also be that when there is an ego threat, Type As work harder to control their anger, leading to greater physiological arousal. In the conflict condition in the present experiment, there was a possibility of retaliation, and therefore, more threat to becoming the better learner and receiving the reward. Thus, Type As in the conflict condition might have been more challenged than Type Bs, resulting in an increase in sympathetic activity. In the same vein, it may have been that Type As, because of their exaggerated involvement in control, might have perceived the conflict condition as more restricting than Type Bs. This external inhibition imposed on their behaviour might have threatened their desire to control, leading to increased sympathetic activity.

When the data from the two stressors (provocation and conflict) were combined, their effects were more pronounced in Type As. Provoked Type As in the conflict condition had higher levels of heart rate than any of the other groups and they reported the most freedom in using noise, although behaviourally they did not use it more than Type Bs. These results are in line with the research, which indicates that Type As relative to Type Bs are more sensitive to reactance manipulations (e.g., Rhodewalt & Comer, 1982; Rhodewalt & Davison, 1983) and become more physiologically aroused when harassed or annoyed (Glass et al., 1980). For example, in the Rhodewalt and Comer (1982) study it was found that Type As in a choice elimination paradigm, perceived the eliminated choice as more attractive, which suggests that they react more to loss of behavioural freedom. Although, Rhodewalt and Comer (1982) did not link physiological responses to loss of behavioral freedom, as shown above, other studies have done so (e.g., Pittner, Houston, & Spiridigliozzi, 1983). Thus, Type As when their behavioural freedom is limited by external agents may react to this loss of freedom more than Type Bs and this reactance may be the basis of the enhanced sympathetic activity. Taken together all these observations indicate an underlying psychological mechanism, possibly related to overinvolvement with control, interacting with physiological processes.

One can argue that Type As were affected more by the provocation and the conflict manipulations but were perhaps attempting to overcome the effects. In applying the notion of Type As' exaggerated involvement with control to the results observed, it may be that Type

As were attempting to control the frustration created by the provocation and conflict manipulations by inhibiting direct behavioural aggression and evaluating the confederate more positively. This behaviour may have an instrumental value in achieving goals in situations where there are external negative consequences associated with displaying aggression.

Conversely, inhibiting behaviour to cope with the stressor may lead to physiological arousal. This physiological arousal can also become a stimulus for further reactions. In the context of Schachter's two-factor theory of emotion (Schachter, 1964), Type As affected by the stressors might have experienced greater physiological arousal, perceived it as a loss of control, and experienced negative affect. Negative affect could further reinforce their perceptions of loss of control and increase their physiological arousal. Although the reasons for the physiological arousal observed in this study need to be investigated further, it is clear that despite this arousal, Type As were able to control their aggressive tendencies. This might be due to their experience in similar situations and their experiences related to control. One may speculate that because of their characteristics, Type As might have encountered situations in which they felt aggressive more so than Type Bs and might have more experiences involving control. Thus, they might have mastered some strategies which enabled them to control their aggressive tendencies. Hence, there were no significant results regarding the aggressiveness of Type As. Their positive evaluation of the learner despite their negative mood is another indication of this control. However, when



they encountered both stressors at once they might have started to lose some of their control and, as an attempt to restore their conscious control over their aggressive tendencies, they might have resorted to the indirect mode of aggression, by using the longer durations of noise. Since, this form of inhibition is in line with the suppressed hostility hypothesis, it would be expected that provoked Type As in the conflict condition would have greater physiological arousal, which is supported by the results of this study.

From this point of view, the results of the present study are consistent with the general trend in the literature regarding aggressiveness of Type As and add to it in important ways. It could be argued that interpersonal stressors are linked to aggression in Type As and aggression, whether inhibited or not, has implications for them at the physiological level, perhaps increasing the risk of the Type A individual for coronary heart disease. Further, the results suggest that Type As are affected both by provocation and external restrictions on their behaviour, more so than Type Bs. However, although they may be affected both emotionally and physiologically, whether they will react to the situation in an aggressive manner appears to depend on the kind and the level of a stressor. This may be due to the excessive concern of Type As with control. Thus, Type As may react to different stressors differently; specifically, under low levels of a stressor they may maintain behavioural control and not show aggression. However, as the intensity of stressors increase, Type As may become more aroused and show aggression. This aggression in

itself may be another attempt to maintain control. Thus, aggression as a characteristic of Type As, needs to be viewed from a dynamic interactional perspective, incorporating different levels of analysis. Since in this study, the concept of control was not directly investigated, future research in the aggression area with Type As may benefit from the inclusion of the assessments of objective control, subjective control and desire to control. It would be beneficial to find out, using a multifactorial strategy, under what conditions Type As show aggression and how they appraise and cope in these situations in comparison to situations in which they do not show aggression.

REFERENCES

- Baron, R.A., Russell, G.W., & Arms, R.L. (1985). Negative ions and behavior: Impact on mood, memory and aggression among Type A and Type B persons. Journal of Personality and Social Psychology, 43, 746-754.
- Barefoot, J.C., Dahlstorm, W.G. & Williams, R.B. (1983). Hostility, coronary heart disease incidence and total mortality: A 25 year study of 255 physicians. Psychosomatic Medicine, 45, 59-63.
- Blumenthal, J.A., Williams, R.B., Kong, Y., Schanberg, S.M., & Thompson, L.W. (1978). Type A behaviour pattern and coronary atherosclerosis. Circulation, 58 634-639.
- Bortner R.W., & Rosenman, R.H. (1967). The measurement of pattern A behavior. Journal of Chronic Diseases, 20, 525-533.
- Bryne, D. (1971) Attraction Paradigm, New York: Academic Press.
- Burnam, M.A., Pennebaker, J.W., & Glass, D.C. (1975). Time consciousness, achievement striving and the Type A coronary prone behaviour pattern. Journal of Abnormal Psychology, 84, 76-79.
- Buss, A. (1961). The Psychology of Aggression, New York: Wiley
- Caffrey, B. (1968). Reliability of personality and behavioural measures in a study of coronary heart disease. Journal of Chronic Disease, 21, 191-204.
- Caffrey, B. (1970). A multivariate analysis of sociopsychological factors in monks with myocardial infarctions. American Journal of Public Health, 60, 452-458.
- Carruthers, M.A. (1969). Aggression and atheroma. Lancet, 2, 1170.

- Carver, C.S., Coleman, A.E., & Glass, D.C. (1976). The coronary prone behaviour pattern and the suppression of fatigue on a treadmill test. Journal of Personality and Social Psychology, 33, 460-466.
- Carver, C.S. & Glass, D.C. (1978) Coronary prone behavior pattern and interpersonal aggression. Journal of Personality and Social Psychology, 36, 361-366.
- Check, J.V.P., & Dyck, D.G. (1986). Hostile aggression and Type A behavior. Journal of Personality and Individual Differences, 7, 819-827.
- Cooper, T., Detre, T., & Weiss, S.M. (1981). Coronary prone behavior and coronary heart disease: A critical review. Circulation, 63, 1199-1215.
- Cook, W.W & Medley, D.M. (1954). Proposed hostility and pharisaic-virtue scales for the MMPI. Journal of Applied Psychology, 38, 414-418.
- Dembroski, T.M., MacDougall, J.M., Shields, J.R., Petito, V., & Lushene, R., (1978). Components of the Type A coronary prone behavior pattern and cardiovascular responses to psychomotor performance challenge. Journal of Behavioral Medicine, 1, 159-176.
- Dembroski, T.M., MacDougall, J.M., Herd, J.A., & Shields, J.L. (1979). Effects of level of challenge on pressor and heart rate responses in Type A and Type B Subjects. Journal of Applied Social Psychology, 9, 209-228.
- Dembroski, T.M., MacDougall, J.M., & Lushene, R. (1979). Interpersonal interaction and cardiovascular response in Type A subjects and coronary patients. Journal of Human Stress, 5, 28-36.

- Diamond, E.L. (1982). The role of anger and hostility in essential hypertension and coronary heart disease. Psychological Bulletin, 92, 410-433.
- Dunn, O.J. (1961). Multiple comparisons among means. Journal of the American Statistical Association, 56, 52-62.
- Dyck, D.G., Moser, C., and Janisse, M.P. (1986). Type A behavior and situation specific perceptions of control. Psychological Reports, (in press).
- Frank, K.A., Heller, S.S., Kornfeld, D.S., Sporn, A.A. & Weiss, M.B. (1978). Type A behavior pattern and coronary angiographic findings. Journal of the American Medical Association, 240, 761-763.
- Friedman, M., & Rosenman, R.H. (1959). Association of specific overt behavior pattern with increases in blood cholesterol, blood clotting time, incidence of arcus senilis and clinical coronary artery disease. Journal of the American Medical Association, 169, 1286-1296.
- Friedman, M., Brown, A.E., Rosenman, R.H. (1969). Voice analysis for detection of behavior pattern: Responses of normal men and coronary patients. Journal of the American Medical Association, 208, 828-836.
- Gastorf, J.W. (1980). Time urgency of the Type A behavior pattern. Journal of Consulting and Clinical Psychology, 48, 299
- Gastorf, J.W., & Teevan, R.C. (1980). Type A coronary prone behavior and fear of failure. Motivation and Emotion, 4, 71-76.
- Glass, D.C., Snyder, M.L., & Hollis, J.F. (1974). Time urgency and the Type A coronary prone behavior. Journal of Applied Psychology, 4, 125-140.

- Glass, D.C. (1977). Behavior Patterns, Stress and Coronary Disease. Hillsdale, New Jersey : Lawrence Erlbaum Associates.
- Glass, D.C., Krakoff, L.R., Contrada, R., Hilton, W.F., Kehoe, K., Mannucci, E.G., Collins, C., Snow, B., & Elting, E. (1980). Effect of harassment and competition upon cardiovascular and plasma catecholamine response in Type A and Type B individuals. Psychophysiology, 17, 453-463.
- Harburg, E., Erfurt, J.C., Chape, C., Hauerstein, L.S., Schull, W.J., Scharf, M.A. (1973). Socio-ecological stress, suppressed hostility, skin colour and black/white blood pressure: Detroit. Psychosomatic Medicine, 35, 276-296.
- Harburg, E., Blakelock, E.H., & Roeper, P.J. (1979). Resentful and reflective coping with arbitrary authority and blood pressure: Detroit. Psychosomatic Medicine, 41, 189-201.
- Haynes, S.G., Feinleib, M., & Kannel, W.B. (1980). Psychosocial factors and CHD incidence in Framingham: Results from an 8 year follow-up study. American Journal of Epidemiology, 108, 229.
- Haynes, S.G., Feinleib, M., & Kannel, W.B. (1980). The relationship of psychosocial factors to coronary heart disease in the Framingham study: III. Eight year incidence of coronary heart disease. American Journal of Epidemiology, 111, 37-57.
- Haynes, S.G., Levine, S., Scotch, N., Feinleib, M., & Kannel, W.B. (1978). The relationship of psychosocial factors to coronary heart disease in the Framingham study: I. Methods and risk factors. American Journal of Epidemiology, 107, 362-383.
- Haynes, S.G., Feinleib, M., Levine, S., Scotch, N., & Kannel, W.B. (1978). The relationship of psychosocial factors to coronary

- heart disease in the Framingham study: II. Prevalence of coronary heart disease. American Journal of Epidemiology, 107, 386-402.
- Hicks, R.A. & Hodgson, J.A. (1981). Type A/B behavior and overt and covert hostility levels of college students. Psychological Reports, 49, 317-318.
- Hokanson, J.E. (1961). The effects of frustration and anxiety on overt aggression. Journal of Abnormal and Social Psychology, 62, 346-351.
- Hokanson, J.E. (1962). The effects of three types of aggression on vascular processes. Journal of Abnormal and Social Psychology, 64, 446-449.
- Hokanson, J.E. & Burgess, M.M. (1962). The effects of status, type of frustration and aggression on vascular processes. Journal of Abnormal and Social Psychology, 65, 232-237.
- Hokanson, J.E., Burgess, M.M., & Cohen, M. (1963). The effects of displaced aggression on systolic blood pressure. Journal of Abnormal and Social Psychology, 67, 214-218.
- Holmes D.S., & Wills, M.J. (1985.) Expression of interpersonal aggression by angered and non-angered persons with the Type A and Type B behavior patterns. Journal of Personality and Social Psychology, 48, 723-727.
- Janisse, M.P., Edguer, N., & Dyck, D.G. (1986). Type A behavior, anger expression and reactions to anger imagery. Motivation and Emotion, 10, 371-386.
- Janisse, M.P., Yerama, C.G., Yeh, E., Moser, C.G., & Dyck, D.G., Type A behavior and the processing of causal attributions in laboratory and naturally occurring settings. (Manuscript submitted for publication)

- Jenkins, C.D., Rosenman, R.H., & Friedman, M. (1968). Replicability of rating the coronary prone behavior pattern. British Journal of Social and Preventive Medicine, 22, 16-22.
- Jenkins, C.D., Zyzanski, S.J., & Rosenman, R.H. (1971). Progress toward validation of a computer scored test for the Type A coronary prone behavior pattern. Psychosomatic Medicine, 33, 193-202.
- Jenkins, C.D., Zyzanski, S.J., Rosenman, R.H., & Cleveland, G.L. (1971). Association of the coronary prone behavior scores with the recurrence of coronary heart disease. Journal of Chronic Diseases, 24, 601-611.
- Jenkins, C.D., Zyzanski, S.J., & Rosenman, R.H. (1976). Risk of new myocardial infarction in middle aged men with manifest coronary disease. Circulation, 53, 342-347.
- Kahn, J.P., Kornfeld, D.S., Frank, K.A., Heller, J.P., & Hoar, P.F. (1980). Type A behavior pattern and blood pressure during coronary artery by-pass surgery. Psychosomatic Medicine, 42, 407-414
- Kornitzer, M., Kittel, F., DeBaker, G. & Dramaix, M. (1981). The Belgian Heart Disease Prevention Project: Type A behaviour pattern and the prevalence of coronary heart disease. Psychosomatic Medicine, 43, 133-145.
- Krantz, D.S., Sanmarco, M.A., Silvester, R.H. & Matthews, K.A. (1979). Psychological correlates of progression of atherosclerosis in men. Psychosomatic Medicine, 41, 467-475.
- Krantz, D.S., Durel, L.A., Davia, J.E., Schaeffer, R.T., Arabian, J.M., Dembroski, T.M., MacDougall, J.M. (1982). Propranolol



- medication among coronary patients: Relationship to Type A behavior and cardiovascular response. Journal of Human Stress, 8, 4-12.
- Krantz, D.S., Arabian, J.M., Davia, J.E., & Parker, J.S. (1982). Type A behavior and coronary artery bypass surgery: Intraoperative blood pressure and perioperative complications. Psychosomatic Medicine, 44, 273-284.
- Krantz, D.S. & Durel, L.A. (1983). Psychobiological substrates of the Type A behavior pattern. Health Psychology, 2, 393-411.
- Malamuth, N.E. (1983). Factors associated with rape as predictors of laboratory aggression against women. Journal of Personality and Social Psychology, 45, 432-442.
- Malcolm, A.T., Janisse, M. P., & Dyck, D.G. (1984). Type A behavior pattern, heart rate and the pupillary response: Effects of cold pressor and ego threat. Journal of Psychosomatic Research, 28, 27-34.
- Matthews, K.A., Glass, D.C., Rosenman, R.H. & Bortner, R.W., (1977). Competitive drive, pattern A and coronary heart disease: A further analysis of some data from the collaborative group study. Journal of Chronic Diseases, 30, 489-498.
- Matthews, K.A., & Saal, F.E. (1978). Relationship of the Type A coronary prone behavior pattern to achievement, power and affiliation motives. Psychosomatic Medicine, 40, 631-636.
- Matthews, K.A., Helmreich, R.L., Beane, W.E., & Lucker, G.W. (1980). Pattern A, achievement striving, and scientific merit: Does pattern A help or hinder? Journal of Personality and Social Psychology, 39, 962-967.

- Matthews, K.A., & Siegel, J.M. (1982). The Type A behavior pattern in children and adolescents: Assessment, development, and associated coronary risk. In R.A. Baum & J. E. Singer (Eds), Handbook of Health and Medical Psychology, (Vol. 2). Hillsdale, N.J.: Erlbaum.
- Matthews, K.A. (1982). Psychological perspectives on the Type A behavior pattern. Psychological Bulletin, 91, 293-323.
- Nielson, N.R., & Neufeld, R.N.J. (1986). Utility of the uncontrollability construct in relation to the Type A behaviour pattern: A multidimensional investigation. Canadian Journal of Behavioral Science, 224-237.
- Obrist, P.A. (1981). Cardiovascular Psychophysiology: A Perspective, New York: Plenum.
- Pittner, M.S., Houston, B.K., & Spiridigliozzi, S. (1983). Control over stress, Type A behavior pattern and response to stress. Journal of Personality and Social Psychology, 44, 627-737.
- Quinlan, C.B., Barrow, J.G., & Moinuddin, M. (1968). Prevalence of selected coronary heart disease factors in Trappist and Benedictine monks. Paper presented at the Conference on Cardiovascular Epidemiology, American Heart Association, Atlanta, Georgia.
- Rosenman, R.H., Friedman, M., Straus, R., Wurm, M., Jenkins, C.D., & Wurm, M. (1966). Coronary heart disease in the Western Collaborative Group Study: A follow-up Experience of 2 years. Journal of the American Medical Association, 195, 86-92.
- Rosenman, R.H., Friedman, M., Straus, R., Jenkins, C.D., Zyzanski, S.J., & Wurm, M. (1970). Coronary heart disease in the Western

- Collaborative Group Study: A follow-up experience of 4 1/2 years. Journal of Chronic Disease, 23, 173-190.
- Rosenman, R.H., Brand, R.J., Jenkins, C.D., Friedman, M., Straus, R., & Wurm, M. (1975). Coronary heart disease in the Western Collaborative Study: Final follow-up experience of 8 1/2 years. Journal of American Medical Association, 223, 872-877.
- Rosenman, R.H. (1978). The interview method of assessment of the coronary behavior. In T.M. Dembroski, S.M. Weiss, J.L. Shields, S.G. Haynes, M. Feinleib (Eds) Coronary Prone Behavior, New York: Springer.
- Rosenman, R.H., Friedman, M., Jenkins, C.D., Straus, R., Wurm, M., & Kositchek, R. (1967). Recurring and fatal myocardial infarction in the Western Collaborative study. American Journal of Cardiology, 19, 771-775.
- Schachter, S. (1964). The interaction of cognitive and physiological determinants of emotional state. In L. Berkowitz (Ed), Advances in Experimental Social Psychology, New York: Academic Press.
- Scherwitz, L., Berton, K., & Leventhal, H. (1978). Type A behavior, self-involvement and cardiovascular response. Psychosomatic Medicine, 40, 593-609.
- Schneider, R., Friedrich, G., Neus, J., Rudel, J., von Eiff, A.W., (1983). The influence of beta blockers on cardiovascular reactivity and Type A behavior pattern in hypertensives. Psychosomatic Medicine, 45, 417-424.
- Schucker, B., & Jacobs, D.R. (1977). Assessment of behavioral risk for coronary heart disease by voice characteristics. Psychosomatic Medicine, 39, 219-228.

- Shekelle, R.B., Gale, M., Ostfeld, A.M. & Oglesby, P. (1983).  
Hostility, risk of coronary heart disease and mortality.  
Psychosomatic Medicine, 45, 109-114.
- Snow, B. (1978). Level of aspiration in coronary prone and non-  
coronary prone adults. Personality and Social Psychology  
Bulletin, 4, 416-419.
- Strube, M.J., Turner, C.W., Cerro, D., Stevens, J. & Hinchey, F.  
(1984). Interpersonal aggression and the Type A coronary prone  
behaviour pattern: A theoretical distinction and practical  
implications. Journal of Personality and Social Psychology, 46,
- Strube, M.J. (1985). Attributional style and Type A coronary prone  
behavior pattern. Journal of Personality and Social Psychology,  
49 2, 500-509.
- Van Egeren, L.F., Abelson, J.L., & Thornton, D.W. (1978).  
Cardiovascular consequences of expressing anger in a mutually  
dependent relationship. Journal of Psychosomatic Research, 22,  
537-547.
- Van Egeren, L. (1979). Social interactions, communications and the  
coronary prone behavior pattern: A psychophysiological study.  
Psychosomatic Medicine, 41, 2-18.
- Van Egeren, L., Sniderman, L.D., & Raggelin, M.S. (1982). Competitive  
two person interactions of Type A and Type B individuals.  
Journal of Behavioural Medicine, 5, 55
- Waldron, I. (1978). The coronary prone behavior pattern, blood  
pressure, employment and socio-economic status in women. Journal  
of Psychosomatic Research, 22, 79-87.

- Williams, R.B., Haney, T.L., Lee, K.L., Kong, Y.H., Blumenthal, J.H., & Whalen R.E. (1980). Type A behavior, hostility, and coronary atherosclerosis. Psychosomatic Medicine, 42, 539-549.
- Wolf, S. (1971). Psychosocial factors in myocardial infarction and sudden death. In L. Levi (Ed) Society, Stress and Disease, London: Oxford.
- Zuckerman, M., & Lubin, B. (1965). Normative data for the Multiple Affect Adjective Check List. Psychological Reports, 16, 438.
- Zurawski, R.M., & Houston, B.K. (1983). The Jenkins Activity Survey measure of Type A and frustration induced anger. Motivation and Emotion, 7, 301-312.
- Zyzanski, S.J., Jenkins, C.D., Ryan, T.J., Flessas, A., & Everest, M. (1976). Psychological correlates of coronary angiographic findings. Archives of Internal Medicine, 136, 1234-1237.

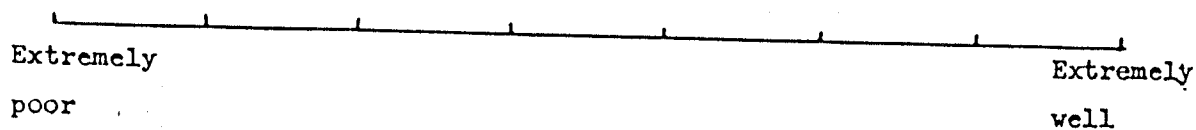
Appendix A  
Health Questionnaire

HEALTH QUESTIONNAIRE

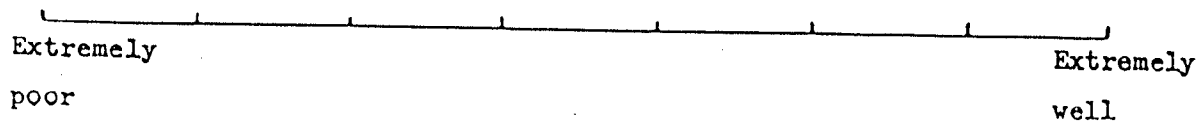
HEIGHT:

WEIGHT:

- 1) Do you, to the best of your knowledge have any health related problems?
- 2) If so, what is the nature of the problems you have?
- B) Did you see a physician about the problem(s) you have indicated?
  - c) What was the nature of the diagnosis given?
- 3) Does your mother have any health related problems?  
If so, please indicate.
- 4) Does your father have any health related problems?  
If so, please indicate.
- 5) Is there any health problem common in your family such as diabetes, high blood pressure?
- 6) Do you find time to exercise in your schedule?
- 7) How often do you exercise?
- 8) How would you rate your physical fitness at the present?



- 9) In comparison to others at your age how would you rate your fitness?



- 10) In comparison to your peak performance how would you rate your physical performance now?



Appendix B  
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 feeling 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?

All right, that completes the interview. Thank you very  
much.

Appendix C  
Survey of Attitudes

SURVEY OF ATTITUDES

1) Social Aspects of the University Life (check one)

In general I am very much against an emphasis on the social aspects of the university life.

In general I am against an emphasis on the social aspects of the university life.

In general I am mildly against an emphasis on the social aspects of the university life.

In general I am in favour of an emphasis on the social aspects of the university life.

In general I am very much in favour of an emphasis on the social aspects of the university life.

2) Canadian way of life (check one)

I strongly believe that the Canadian way of life is not for the best.

I believe that the Canadian way of life is not the best.

I feel that the Canadian way of life is perhaps one of the best.

I feel the Canadian way of life is the best.

I strongly believe that the Canadian way of life is the best.

Welfare Legislation (check one)

I am very much opposed to increased welfare legislation.

I am opposed to increased welfare legislation.

I am mildly opposed to increased welfare legislation.

I am in favour of increased welfare legislation.

I am very much in favour of increased welfare legislation.

War (check one)

I strongly feel that war is sometimes necessary to solve world problems.

I feel that war is sometimes necessary to solve world problems.

I feel that perhaps war is never necessary to solve world problems.

I feel that war is never necessary to solve world problems.

I strongly feel that war is never necessary to solve world problems.

Nuclear Arms Race (check one)

I am very much opposed to the federal government's buildup of nuclear arms.

I am opposed to the federal government's buildup of nuclear arms.

I am mildly in favour of the federal government's buildup of nuclear arms.

I am in favour of the federal government's buildup of nuclear arms.

I am very much in favour of the federal government's buildup of nuclear arms.

Appendix D  
Interpersonal Judgement Scale



INTERPERSONAL JUDGEMENT SCALE

1. Intelligence (check one)

I believe that this person is very much above average in intelligence.

I believe that this person is above average in intelligence.

I believe that this person is slightly above average in intelligence.

I believe that this person is average in intelligence.

I believe that this person is slightly below average in intelligence.

I believe that this person is below average in intelligence.

I believe that this person is very much below average in intelligence.

Knowledge of Current Events (check one)

I believe that this person is very much below average in his knowledge of current events.

I believe that this person is below average in his knowledge of current events.

## Interpersonal Judgement Scale

I believe that this person is slightly below average in his knowledge of current events.

I believe that this person is average in his knowledge of current events.

I believe that this person is slightly above average in his knowledge of current events.

I believe that this person is above average in his knowledge of current events.

I believe that this person is very much above average in his knowledge of current events.

Morality (Check one)

This person impresses me as being extremely moral.

This person impresses me as being moral.

This person impresses me as being moral to a slight degree.

This person impresses me as being neither particularly moral nor particularly immoral.

This person impresses me as being immoral to a slight degree.

This person impresses me as being immoral.

This person impresses me as being extremely immoral.

Interpersonal Judgement Scale

Adjustment (Check one)

I believe this person is extremely maladjusted.

I believe this person is maladjusted.

I believe this person is maladjusted to a slight degree.

I believe that this person is neither particularly maladjusted nor particularly well adjusted.

I believe that this person is well adjusted to a slight degree.

I believe that this person is well adjusted.

I believe that this person is extremely well adjusted.

Personal Feelings (Check one)

I feel that I would probably like this person very much.

I feel that I would probably like this person.

I feel that I would probably like this person to a slight degree.

I feel that I would probably neither particularly like nor particularly dislike this person.

Interpersonal Judgement Scale

Adjustment (Check one)

I believe this person is extremely maladjusted.

I believe this person is maladjusted.

I believe this person is maladjusted to a slight degree.

I believe that this person is neither particularly maladjusted nor particularly well adjusted.

I believe that this person is well adjusted to a slight degree.

I believe that this person is well adjusted.

I believe that this person is extremely well adjusted.

Personal Feelings (Check one)

I feel that I would probably like this person very much.

I feel that I would probably like this person.

I feel that I would probably like this person to a slight degree.

I feel that I would probably neither particularly like nor particularly dislike this person.

Interpersonal Judgement Scale

I feel that I would probably dislike this person to a slight degree.

I feel that I would probably dislike this person.

I feel that I would probably dislike this person very much.

Working Together in an Experiment

I believe that I would very much dislike working with this person in an experiment.

I believe that I would dislike working with this person in an experiment

I believe that I would dislike working with this person in an experiment to a slight degree.

I believe that I would neither particularly dislike nor particularly enjoy working with this person in an experiment.

I believe that I would enjoy working with this person in an experiment to a slight degree.

I believe that I would enjoy working with this person in an experiment.

I believe that I would very much enjoy working with this person in an experiment.

Appendix E

Multiple Affect Adjective Check List

- 1  active  
2  adventurous  
3  affectionate  
4  afraid  
5  agitated  
6  agreeable  
7  aggressive  
8  alive  
9  alone  
10  amiable  
11  amused  
12  angry  
13  annoyed  
14  awful  
15  bashful  
16  bitter  
17  blue  
18  bored  
19  calm  
20  cautious  
21  cheerful  
22  clean  
23  complaining  
24  contented  
25  contrary  
26  cool  
27  cooperative  
28  critical  
29  cross  
30  cruel  
31  daring  
32  desperate  
33  destroyed  
34  devoted  
35  disagreeable  
36  discontented  
37  discouraged  
38  disgusted  
39  displeased  
40  energetic  
41  enraged  
42  enthusiastic  
43  fearful  
44  fine  
45  fit  
46  forlorn  
47  frank  
48  free  
49  friendly  
50  frightened  
51  furious  
52  gay  
53  gentle  
54  glad  
55  gloomy  
56  good  
57  good-natured  
58  grim  
59  happy  
60  healthy  
61  hopeless  
62  hostile  
63  impatient  
64  incensed  
65  indignant  
66  inspired  
67  interested  
68  irritated  
69  jealous  
70  joyful  
71  kindly  
72  lonely  
73  lost  
74  loving  
75  low  
76  lucky  
77  mad  
78  mean  
79  meek  
80  merry  
81  mild  
82  miserable  
83  nervous  
84  obliging  
85  offended  
86  outraged  
87  panicky  
88  patient  
89  peaceful  
90  pleased  
91  pleasant  
92  polite  
93  powerful  
94  quiet  
95  reckless  
96  rejected  
97  rough  
98  sad  
99  safe  
100  satisfied  
101  secure  
102  shaky  
103  shy  
104  soothed  
105  steady  
106  stubborn  
107  stormy  
108  strong  
109  suffering  
110  sullen  
111  sunk  
112  sympathetic  
113  tame  
114  tender  
115  tense  
116  terrible  
117  terrified  
118  thoughtful  
119  timid  
120  tormented  
121  understanding  
122  unhappy  
123  unsociable  
124  upset  
125  vexed  
126  warm  
127  whole  
128  wild  
129  willful  
130  wilted  
131  worrying  
132  young

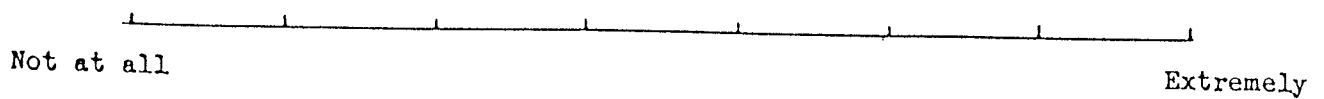
Appendix F  
Expectations Questionnaire



EXPECTATIONS QUESTIONNAIRE

To what extent do you believe the following are important in a learning situation?

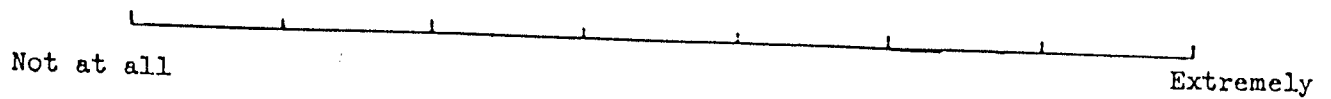
Luck



Ability



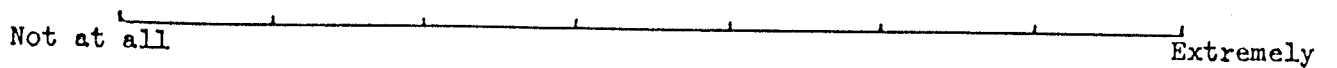
Task



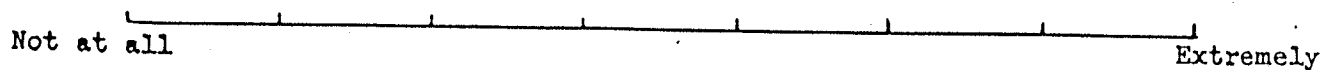
Effort



In comparison to others, to what extent do you think the learner has the ability to learn in this task?



In comparison to others to what extent do you think the learner will put forth effort to learn in this task?

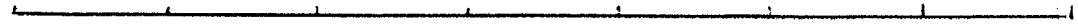


In comparison to others to what extent do you think the learner will perform well in this task?



Appendix G  
Motivation Questionnaire

In comparison to others how well do you think the subject performed on the task?



Not at all

Extremely well

To what extent did the learner's performance depend on factors with him as opposed to factors related to you as a teacher?

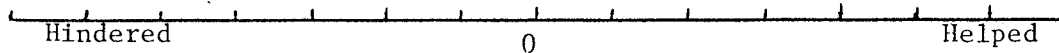


Not at all

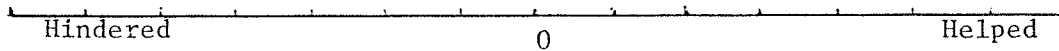
Extremely

Rate the extent and direction of influence of each of the following factors on the subject's performance?

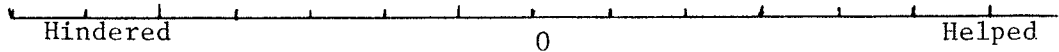
Luck



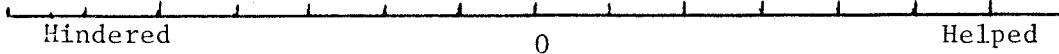
Ability



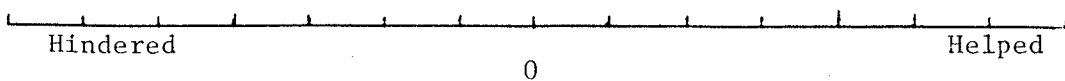
Task



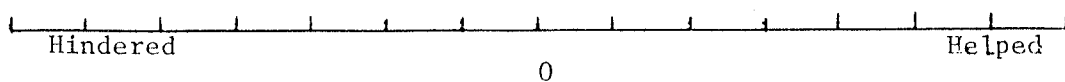
Effort



Effects of noise



Effects of points



To what extent did you feel completely free in using points?

Not at all Extremely

To what extent did you feel completely free in using noise?

Not at all Extremely

To what extent did you use noise to help the learner?

Not at all Extremely

To what extent did you use points to help the learner?

Not at all Extremely

To what extent did you use points to hurt the learner?

Not at all Extremely

To what extent did you use noise to hurt the learner?

Not at all Extremely

Appendix H  
Evaluations

#### NEUTRAL EVALUATION

It is difficult to get a clear impression of someone with so little information. However, it seems to me that this person and myself are quite alike. I feel that generally his attitudes are similar to mine. He seems genuine. I think I wouldn't mind becoming friends with this guy or socializing with him.

#### NEGATIVE EVALUATION

It is difficult to get a clear impression of someone with so little information. However, it seems to me that this person and myself are quite unlike. I feel that he is narrow in his attitudes. He seems phony. I don't think I could become friends with this guy or would consider socializing with him.

Appendix J  
Instructions

## INSTRUCTIONS FOR THE CONFLICT

### CONDITION

Now we are ready to begin the task. If at any point you don't understand the instructions my assistant can stop the tape and explain them to you. In this task, there will be 15 geometric and arithmetic series which will be transferred to the learner. The learner is expected to predict the next number occurring in the series. The series will be presented for 7 seconds and the learner is expected to give an answer within 7 seconds after the series disappear on the screen. The teacher is expected to give negative feedback to the incorrect responses and positive feedback to the correct responses. The negative feedback will be noise ranging from level 1 to level 7. Levels of noise correspond to numbers 1 to 7 on the keyboard of the computer. For example, level 1 noise will correspond to number 1, level 3 noise will correspond to number 3 and so on. The positive feedback will be points ranging from 1 to 7. Similar to negative feedback the points will correspond to numbers 1 to 7 on the keyboard. In other words, by pressing keys ranging from 1 to 7 you can increase or decrease the points given to the learner depending on how well or poorly you think he performed, similar to the negative feedback. Both the positive and the negative feedback is a signal to the learner in terms of how well or poorly he is performing. Therefore, you may select any level of points or noise depending on how well or poorly you think the learner performed on a specific trial. The range of noise used in this experiment will not harm the learner in any way. However, as in the case of positive feedback it may help or hinder learning. Research indicates that there is an optimal level of physiological arousal for learning. Depending on this level at a specific point in time both positive and negative feedback may facilitate or hinder learning. We would like to find out the relationship of physiological arousal to positive and negative feedback. Therefore, please feel free to use any level of positive and negative feedback to correct and incorrect responses respectively.

Once we are finished with 15 of the series we will ask the teacher to change places with the learner since we would like to assess the effects of previous exposure to a learning process. This time the learner will be in the teacher's position and by using the same procedure with a new set of 15 series will try to help the learner in the task. Since we would like you to be motivated to do your best as a learner the best learner among the two of you determined by the least number of errors will receive a small reward at the end of the session. On the basis of our experience this reward may be a value to you. At this point we would like to bring to your attention that the learner will be aware of the levels of both positive and negative feedback you have used, since these values will be transferred to him to help him in the learning process. Hence, the levels of feedback you used as a teacher, in the mind of your counterpart may determine the levels of feedback he is going to give you when you are the learner.



## INSTRUCTIONS FOR THE NO CONFLICT

### CONDITION

Now we are ready to begin the task. If at any point you don't understand the instructions my assistant can stop the tape and explain them to you. In this task, there will be 15 geometric and arithmetic series which will be transferred to the learner. The learner is expected to predict the next number occurring in the series. The series will be presented for 7 seconds and the learner is expected to give an answer within 7 seconds after the series disappear on the screen. The teacher is expected to give negative feedback to the incorrect responses and positive feedback to the correct responses. The negative feedback will be noise ranging from level 1 to level 7. Levels of noise correspond to numbers 1 to 7 on the keyboard of the computer. For example, level 1 noise will correspond to number 1, level 3 noise will correspond to number 3 and so on. The positive feedback will be points ranging from 1 to 7. Similar to negative feedback the points will correspond to numbers 1 to 7 on the keyboard. In other words, by pressing keys ranging from 1 to 7 you can increase or decrease the points given to the learner depending on how well or poorly you think he performed, similar to the negative feedback. Both the positive and the negative feedback is a signal to the learner in terms of how well or poorly he is performing. Therefore, you may select any level of points or noise depending on how well or poorly you think the learner performed on a specific trial. The range of noise used in this experiment will not harm the learner in any way. However, as in the case of positive feedback it may help or hinder learning. Research indicates that there is an optimal level of physiological arousal for learning. Depending on this level at a specific point in time both positive and negative feedback may facilitate or hinder learning. We would like to find out the relationship of physiological arousal to positive and negative feedback. Therefore, please feel free to use any level of positive and negative feedback to correct and incorrect responses respectively.

Once we are finished with 15 series, we will ask the teacher to be the learner but with a new subject coming for this experiment who will be the teacher since we would like to assess the effects of previous exposure to a learning situation. Since we want you to be motivated and do your best as a learner the best learner among the two of you that is the learner in the first trial and the learner in the second trial, will receive a small reward. On the basis of our experience we feel that this reward may be of value to you.