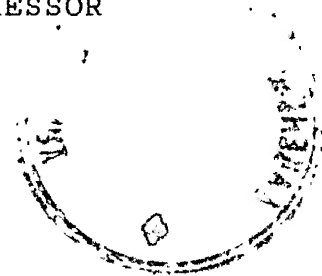


THE EFFECTS OF THE ANGER EXPRESSION AND HOSTILITY COMPONENTS OF
THE TYPE A PERSONALITY BEHAVIOR PATTERN ON PHYSIOLOGICAL RECOVERY
FROM A PSYCHOSOCIAL STRESSOR



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ABSTRACT

The present study re-examined the relationship of the Type A Behavior Pattern to heart rate and finger temperature recovery from a psychosocial stressor. It also investigated the role of anger expression, hostility and rehearsal as predictors of delayed heart rate and finger temperature recovery. 30 male and 29 female students were given questions of multiplication, division, addition, subtraction, with a few geography and general knowledge questions also included. Heart rate and finger temperature were measured before, during, and after the stressor presentation. Results showed that heart rate recovery was significantly slower for those individuals who scored high on AngerIn and Rehearsal scales. No heart differences in recovery were found between Type A and Type B individuals. Evidence was presented that the Rehearsal scale has an anger component which may be responsible for its relationship to slower heart rate recovery. In contrast to the rapid recovery of heart rate, finger temperature did not recover over the 10 minute recovery period. There were no significant correlations between finger temperature recovery and personality.

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Hart and Jamieson (1983) reported that individuals identified as having a Type A Behavior Pattern (TABP) (using the Jenkins Activity Survey), exhibited significantly slower heart rate (HR) recovery from a psychosocial stressor than their Type B counterparts. They then went on to suggest that the prolonged rate of recovery by the Type A individual may be one of the mechanisms which underlies the high rate of Coronary Heart Disease (CHD) in those with the Type A Behavior Pattern. However, recent research has raised serious doubts about the role of TABP in CHD. It now appears that only the anger and hostility components of the TABP may be related to CHD. The present study will re-examine the relationship of TABP and recovery by assessing the relative importance of the overall A-B pattern and the differences in anger and hostility with respect to recovery.

THE TYPE A BEHAVIOR PATTERN

Through observation of the personality characteristics of individuals suffering from CHD, Friedman and Rosenman developed the Type A coronary-prone behavior pattern (Friedman and Rosenman, 1959). They were able to apply general personality characteristics to those whom they identified as either Type A or Type B. Friedman and Rosenman stated that the Type A individual

is characterized by aggressiveness, competitiveness, excessive drive, high productivity, and a sense of time urgency (Jenkins, Rosenman, and Friedman, 1967).

The Type B individual is the opposite of the Type A individual.

The Type B subject is relaxed and more easy going, seldom becomes impatient, and takes more time to enjoy avocational pursuits. He is not easily irritated and works steadily, but without a feeling of being driven by a lack of time. He is not pre-occupied with social achievement, and is less competitive in his occupational and avocational pursuits. He moves and speaks in a slower and more smoothly modulated style. (Jenkins et al, 1967, pp.371).

One of the original methods used to identify the Type A or Type B individual was the Structured Interview (SI). The SI involves a set of questions (created by Rosenman and Friedman) which are asked in a specific manner by the interviewer and the tape recorded responses are later scored. There are four independent factors in the Structured Interview: 1) clinical ratings of speech characteristics 2) self-reports of pressured drive 3) hostility 4) competitiveness.

Due to the difficulty in administering the SI accurately, many scales have been created to assess the Type A characteristics. The Jenkins Activity Survey (JAS) has been one of the most frequently used of the new tests. It was created

by Jenkins in 1971 and contains 50 questions which were obtained through discriminant analysis of the responses of the subjects from the Western Collaborative Group Study (Jenkins et al, 1971). The Framingham Type A Pattern Scale and the Bortner Scale are also used to identify Type A personalities, but they are not used as widely as the Jenkins Activity Survey.

The first large scale study of Type A Behavior Pattern (TABP) and coronary heart disease (CHD), was the Western Collaborative Group Study (WCGS) which was an indepth investigation of 3500 men in the San Fransico area. This study was done by Rosenman, Friedman et al in 1964. The study found that those men who were identified as Type A at the beginning of the study were twice as likely to develop CHD as those who were identified as Type B (Rosenman et al, 1975). This study was a mainstay in Type A Behavior Pattern and CHD research for many years.

ANGER AND HOSTILITY IN CHD

However, according to recent research, the use of the Type A Coronary Behavior Pattern as a global construct to predict coronary heart disease is not as useful as previously believed (Linden, 1987; Dembroski, 1985; Diamond, 1982; and Matthews, 1977).

Matthews et al (1977) conducted one of the first major reviews which seriously questioned the predictive value of the TABP. Matthews and her colleagues reanalyzed the data of a sub-sample of 186 men from the Western Collaborative Group Study and found that hostility, drive, and vigor were the personality characteristics which most strongly differentiated between those who acquired CHD and those who did not. Williams et al (1979) found that both TABP and Hostility Scores were independently related to the presence of atherosclerosis. As well, they found that the hostility score was more strongly related to atherosclerosis than was TABP.

Similary, Dembroski et al (1985) in their research on TABP, found that it was not the TABP itself which was related to coronary disease severity, but that only the potential for hostility and anger-in (that is, anger which is not overtly expressed) were positively associated with the severity of the disease. Diamond (1982) reviewed recent studies involving anger and hostility in relation to CHD and Hypertension. He found that anger and hostility have been consistently indicated as psychological factors in essential hypertension, but that there was less research relating anger and hostility and CHD. However, Diamond does state that recent research is indicating that the hostility component of the global TABP is a predictor variable of atherosclerosis.

Linden's review (1987) seriously questions the findings which seem to indicate that a relationship exists between the TABP and CHD. He does not believe that the TABP is a predictor of CHD; in his view, it can only successfully predict elevated blood pressure. Linden's argument that TABP is not a global construct is based on his belief that there is not enough evidence for concurrent and predictive validity of the global construct. Further, Linden questions the value of the structured interview as it has been considered necessary for the interviewer to be instructed by its creators, Rosenman and Friedman. This is not only expensive for the novice interviewer but somewhat impractical as well. As a result of these findings in TABP and CHD research, it is now evident that future research must look at the hostility and anger aspects of personality when attempting to understand contributing factors to CHD, as research is now indicating that the TABP as a global construct is not the strong predictor of CHD that it was once believed to be.

Dimsdale et al (1978) failed to find any positive relationships between the TABP and coronary atherosclerosis as had previous studies. More and more new evidence is indicating that the hostility and anger components of the TABP are related to coronary heart disease. But it is not just new research which identifies this relationship, older research such as that done by Dunbar (1943) or Menninger and Menninger (1936), which although

in a psychoanalytic framework, indicated that suppressed anger and aggression lead to the development of CHD.

Shekelle et al (1983) examined the predictive value of the Cook Medley Scale and CHD. His study used 1877 male participants, who were employed at the Hawthorne Works of the Western Electric Company in Chicago, and had been given the Cook Medley Hostility Scale in 1957-1958. The incidence of CHD was investigated 10 and 20 years after the initial study. Shekelle found that in the first ten years CHD (ie. myocardial infarction and death due to CHD) was lowest in the first quintile of the Hostility Scores, highest in the middle quintile of the score distribution, and intermediate in the other three quintiles. The Ho (Hostility Score) also had positive associations with the 20 year risk of death from CHD. An interesting finding in his study, was that Ho scale was positively and significantly related with risk of death from all causes. Shekelle et al suggest then that the Ho scale may be related to something which has an effect on survival. Similarly, Barefoot et al (1983) did a 25 year follow-up of 255 doctors (all of whom had taken the MMPI during their medical training) and found that high Ho scores were predictive of CHD and total mortality.

Assessment of Anger and Hostility

One of the first tools to assess anger was created by Cook and Medley in 1954 from a subset of questions from the MMPI. The Cook Medley, a pen and paper test, contains questions such as: "When someone does me wrong I feel I should pay him back if I can, just for the principle of the thing", "I feel that I have often been punished without cause". Scores are assessed by the number of true responses the individual indicated on his/her sheet with a high score indicating greater hostility.

The most recent indepth look at the nature of anger and hostility was done by Spielberger et al (1985). They attempted to clarify the issue of how to measure anger and hostility as well as identifying the conceptual differences between them. Spielberger proposed the concept of the "AHA Syndrome". The "AHA Syndrome" was introduced to show that the words anger, hostility, and aggression have been used interchangeably in research by individuals who do not recognize the conceptual differences which exist between them.

Here, Spielberger differentiates between anger, hostility and aggression:

Anger is generally considered to be a simpler concept than hostility or aggression. The concept of anger usually refers to an emotional state that consists of feelings that vary in intensity, from mild irritation

or annoyance to fury and rage. Although hostility usually involves angry feelings, this concept has the connotation of a complete set of attitudes that motivate aggressive behaviors directed toward destroying objects or injuring other people.

While anger and hostility refer to feelings and attitudes, the concept of aggression generally implies destructive or punitive behavior directed towards other persons or objects. It should be noted, however, that aggression and hostility are often used interchangeably. A useful convention for distinguishing between these concepts is the distinction between hostility and instrumental aggression. Whereas hostile aggression refers to behavior motivated by anger, instrumental aggression refers to aggressive behavior directed toward removing or circumventing an obstacle that stands between an aggressor and a goal, when such behavior is not motivated by angry feelings. (p.7).

Spielberger believes that anger is the core of the AHA! Syndrome. To measure anger, Spielberger developed the State-Trait Anger Scale (STAS) which assesses the intensity of the individual's anger as an emotional state and the individual differences in anger proneness as a personality trait (1985). He defines trait anger as individual differences in the disposition to experience anger, which would be reflected in the frequency that State anger was experienced over time (p.9). An example of S-Anger items are "I am furious", "I feel angry", "I feel irritated", "I am burned up". (p.10). The individual responds to the questions from a four point scale - "Not at all", "Somewhat", "Moderately so", "Very much so", which corresponds to how the individual feels at that moment. Examples of Trait-Anger items are: "I have a fiery temper", "I am a hotheaded person", "It

makes me furious when I am criticized in front of others". (p.10). The individual again answers according to a four point scale, choosing the response which most closely resembles how they feel at that moment: "Almost never", "Sometimes", "Often", "Almost always".

In addition to this overall view of anger, there has been considerable focus over the years on the direction of the expression of anger. That is, whether the expression of anger is directed outward or inward. For example, Funkenstein et al (1954) distinguishing between "anger in" and "anger out" and their effects on the cardiovascular system found that students who were classified as "anger in" had an increase in pulse rate three times greater than those who were classified as "anger out". In similar research Gentry et al (1982) found that elevated blood pressure and essential hypertension are positively associated to the holding in of anger. To study the concept of "anger in" and "anger out" further, Spielberger developed the Anger Expression Scale (AX). Here, the scale assesses individual differences in anger expression as a personality trait, instead of focusing on the intensity of the individual's anger at that moment.

Working within that framework, Spielberger defined anger-in as "how often angry feelings are experienced but not expressed",

(1986, p.14). Whereas, anger-out was defined as: " the extent that an individual engages in aggressive behaviors when motivated by angry feelings", (1986, p.14). The AX Scale consists of 33 items and the individuals are asked to indicate how often they behaved in a particular manner, such as: "I lose my temper"; "I boil inside, but I don't show it". They are to respond according to a four point scale, selecting the answer which most closely resembles the frequency of the behavior: 1) Almost never 2) Sometimes 3) Often 4) Almost always. Johnson (1984) used the AX Scale to study the relationship between anger expression and blood pressure. Using 1114 high school students, he obtained their systolic blood pressure and the diastolic blood pressure. He found positive correlations between the AX/In scores and the two blood pressure measures for both the male and female students. After separate multiple regression analysis, Johnson found that the AngerIn scores were better predictors of blood pressure than any other measure for white males and black males and females.

Recovery from Stress

Several mechanisms have been proposed to explain how TABP translates into CHD. The main explanation is that Type A's as compared to Type B's are more physiologically reactive to stress and therefore experience more "wear and tear". Another

explanation is that A's chronically expose themselves to more stressors than do B's (Somes et al, 1981). A third explanation was offered by Hart and Jamieson on the basis of their finding that A's took longer to recover from a psychosocial stressor than did B's. They suggested that this prolonged arousal and delay from recovery may result in more "wear and tear" on that individual.

Hart and Jamieson's (1983) study showed that the Type A individual had higher heart rates during the first minute of the recovery period than their Type B counterparts. Hart and Jamieson's study supported the findings of the Houston and Jorgensen study (1981), that Type A students had significantly higher heart rates during the recovery period than Type B students.

Similarly, Jamieson and Lavoie (1987) who looked at the Type A personality and aerobic fitness, found the Type As had slower heart rate recovery than type Bs. Jamieson and Lavoie then went on to infer that Type A individuals may be at greater risk of disease since they are slower to recover in more situations than the Type B individuals.

Although the Hart and Jamieson study showed that Type A individuals take longer to recover than Type B individuals, it is now evident through new research that the Type A Behavior Pattern

itself is not directly related to CHD. As stated earlier, it has been found that it is the anger and hostility components of the TABP which are the important predictors of CHD. It is therefore important to investigate the role of hostility and anger with respect to recovery from a psychosocial stressor.

If delayed recovery from stress is associated with the anger and hostility components of the TABP, then delayed recovery remains a plausible mechanism for contributing to CHD. However, if other aspects of the Type A behavior pattern (eg. competitiveness) are responsible for the delayed recovery, then no evidence would exist to support a role of delayed recovery in contributing to CHD.

A second issue to be examined in the present study arose from the report by Jamieson and Roger (1986) that slower recovery from stress is related to high scores on a Rehearsal scale, measuring the tendency towards perseverative thinking. This scale is one of four subscale of a new instrument designed to measure emotional control (Roger and Nesshoever, 1987). Jamieson and Roger (1986) suggest that their finding indicates that individuals who cognitively perseverate following a stressful episode, continuing to mull over the event, will take longer to recover physiologically.

Jamieson and Sekulich (1988) replicated the Jamieson and Roger (1986) finding, but from examination of those individual

scale items which were most closely related to slower recovery, they raised the possibility that anger may be a central factor in determining this relationship. Because anger may be implicated in the relationship between delayed recovery and both the TABP and the Rehearsal Scale, the present study was designed to clarify these interrelationships.

The Present Study

The present study is an attempt to clarify the role of TABP and cognitive rehearsal in recovery from stress by assessing the importance of anger and hostility and rehearsal in this relationship. Following the presentation of a psychosocial stressor individual differences in heart rate recovery and finger temperature recovery were examined. Finger temperature recovery was investigated because the Beckman polygraph was able to accommodate another physiological measure without any difficulty. Information in literature (e.g. Mittlemann & Wolff 1939; and Hugdahl, Fagerstrom, & Broback, 1984) has indicated that finger temperature may reflect changes in stress levels. As well, studies have found (Freedman et al., 1985) that finger temperature decreases and heart rate increases when an individual is stressed, but little research has investigated whether finger temperature recovers as quickly as does heart rate when the stressor is removed. Although not a goal of this study, the facilities allowed for the investigation of finger temperature.

The primary goal of this research was to determine whether the prolonged rate of cardiovascular recovery on the part of those identified as Type A is due to their anger expression or hostility component of their personality, or whether it is due to the global Type A construct itself.

METHOD

Subjects: The subjects were 30 female and 30 male Psychology 1100 students from Lakehead University. Each student received one mark towards the final grade of their course mark. One female was excluded from the experiment as she used medication to control her asthma.

Apparatus: Five measures of personality were used. These were: Jenkins Activity Survey Form T (Krantz et al., 1974), the Cook Medley Hostility Scale (Cook and Medley, 1954), the Anger Expression Scale (Spielberger et al., 1986), and the Roger and Nesshoever Rehearsal Scale (Roger and Nesshoever, 1986). The Jenkins Activity Survey consists of 44 questions. The Cook Medley Hostility Scale is made up of 50 questions which require either true or false answers to the questions. The anger expression scale has 24 questions. The answers are presented in Likert form: almost never, sometimes, often and almost always;

the subjects selecting the response which most closely resembles how they describe their reactions or behavior. The Roger and Neshoever Rehearsal scale consists of 11 questions which are presented in a true/false form. A post experimental self report questionnaire was developed to assess how stressful the subjects found the stress session. The post experimental questionnaire consisted of 5 questions in which the subjects were asked to indicate the extent to which they felt worried, confident, anxious, stressed and angry. The subjects responded on a Likert scale indicating one of the following: not at all, somewhat, moderately so, or very much so.

Heart rate was recorded by a photoplethysmographic transducer on the first phalanx of the left hand middle finger. The transducer was attached to a voltage/pulse/pressure coupler of a Beckman polygraph (Type RS). Heart rate was measured by counting the number of beats that occurred on the polygraph output for each minute.

Finger temperature was recorded from a finger temperature sensor (Yellow Springs, Model 409) which was attached to a thermistor coupler (9858) of a Beckman polygraph and to the first phalanx of the middle finger of the right hand. Finger temperature was measured in degrees celsius from the polygraph output for each minute. The paper was centered on 29 ° C.

The stressor was a series of orally presented questions of multiplication, division, addition, and subtraction, with a few geography and general knowledge questions also included (see appendix). The subjects answered the questions out loud.

Procedure: Room temperature was taken each day to make sure that it was consistent. Similarly, the Beckman polygraph was checked each day. The room was sprayed with a static guard to ensure that there would be no interference with the operation of the polygraph. After completing the paper and pencil tests, the subjects were hooked up to the Beckman polygraph in order to measure their heart rate and finger temperature. After the transducers and sensor were attached, the subjects were asked to close their eyes for a few minutes and to relax. After 10 minutes (baseline) the subjects were told: "In a few moments you shall be given an intellectual task which is at the approximate level of grade five. Please answer the questions as quickly and as accurately as possible. When the quiz is finished, I want you to remain in your seat and attempt to relax again. You will not be given your score on the quiz." The questions were given orally, face to face at the rate of one question approximately every 10 to 15 seconds. The examiner stood in front of the subject who was sitting in a chair. The examiner tapped a pen on a clip board (upon which the questions were placed) continually every second for the duration of the stress period.

If the subject had not answered the question within 15 seconds the next question was asked. The stress period lasted for 5 minutes, whereupon, the subjects were informed that the questions were over and that they would be finished in 10 minutes when the recovery period was over. The experimenter remained in the room during the recovery period. After the 10 minute recovery period was completed, the subjects were unhooked and were then asked to complete the self report questionnaire. Upon completion of the questionnaire, the subjects were debriefed and given the general nature of the study and the equipment. They were asked not to tell the other subjects about the experiment.

RESULTS

Table 1 contains the correlations between the personality measures and the means and standard deviations for each measure. The mean of 7.03 for the Jenkins Activity Survey is typical of the mean for college students (Glass, 1977a). The mean of 15.19 for AngerOut is very close to the means of 16.64 (males) and 16.75 (females) that Spielberger (1986) obtained for high school students. Similarly, the mean of 17.63 for AngerIn is close to the mean of 18.92 (males) and 18.04 (females) Spielberger also obtained (1986). The mean of 4.56 for the Rehearsal scale is close to the means of 5.33 (males) and 4.86 (females) obtained by Roger and Nesshoever (1986) with university students in England.

TABLE 1

PEARSON CORRELATION COEFFICIENTS
FOR PERSONALITY MEASURES

	JENKINS	REHEARSAL	ANGEROUT	ANGERIN	COOK
JENKINS		.342**	.351**	.231	.317*
REHEARSAL			.554**	.263*	.450*
ANGEROUT				-.050	.438*
ANGERIN					.459*

**=Significant at p=.01

* =Significant at p=.05

MEANS AND STANDARD DEVIATIONS FOR PERSONALITY MEASURES

JENKINS	MEAN = 7.03	S.D. = 3.10
REHEARSAL	MEAN = 4.56	S.D. = 3.09
ANGEROUT	MEAN = 15.19	S.D. = 3.97
ANGERIN	MEAN = 17.63	S.D. = 3.72
COOK	MEAN = 21.08	S.D. = 6.58

HEART RATE

Both males and females showed similar significant HR increases from the last minute of the rest period to the stress periods (see Figure 1). T-tests revealed significant rest to stress HR increases for the male subjects (16.53 beats per minute) and for the female subjects (16.83 beats per minute). Since sex differences were not of primary interest, and since no interaction with sex appeared for any of the heart rate analyses, only analyses on the entire sample are presented here.

To investigate heart rate during the stress session, the heart rates were averaged over the total stress time period, yielding a single mean stress HR. To obtain a baseline free index of change, partial correlations were calculated using mean stress heart rate as the criterion and the variability associated with base heart rate removed. None of the personality measures were related to heart rate reactivity (see Appendix for partial correlations at each of the 5 minutes of the stress period). Similarly, no relationship was found between the post experimental questionnaire responses and mean stress HR.

It was found that heart rate recovery was complete by 45 seconds (see Figure 2). Therefore, HR during the first 45 seconds of recovery was used as the index of recovery HR. Partial correlations were used in order to control for resting heart rate and stress heart rate while investigating heart rate

FIGURE 1

Heart Rate and Recovery for Males and Females

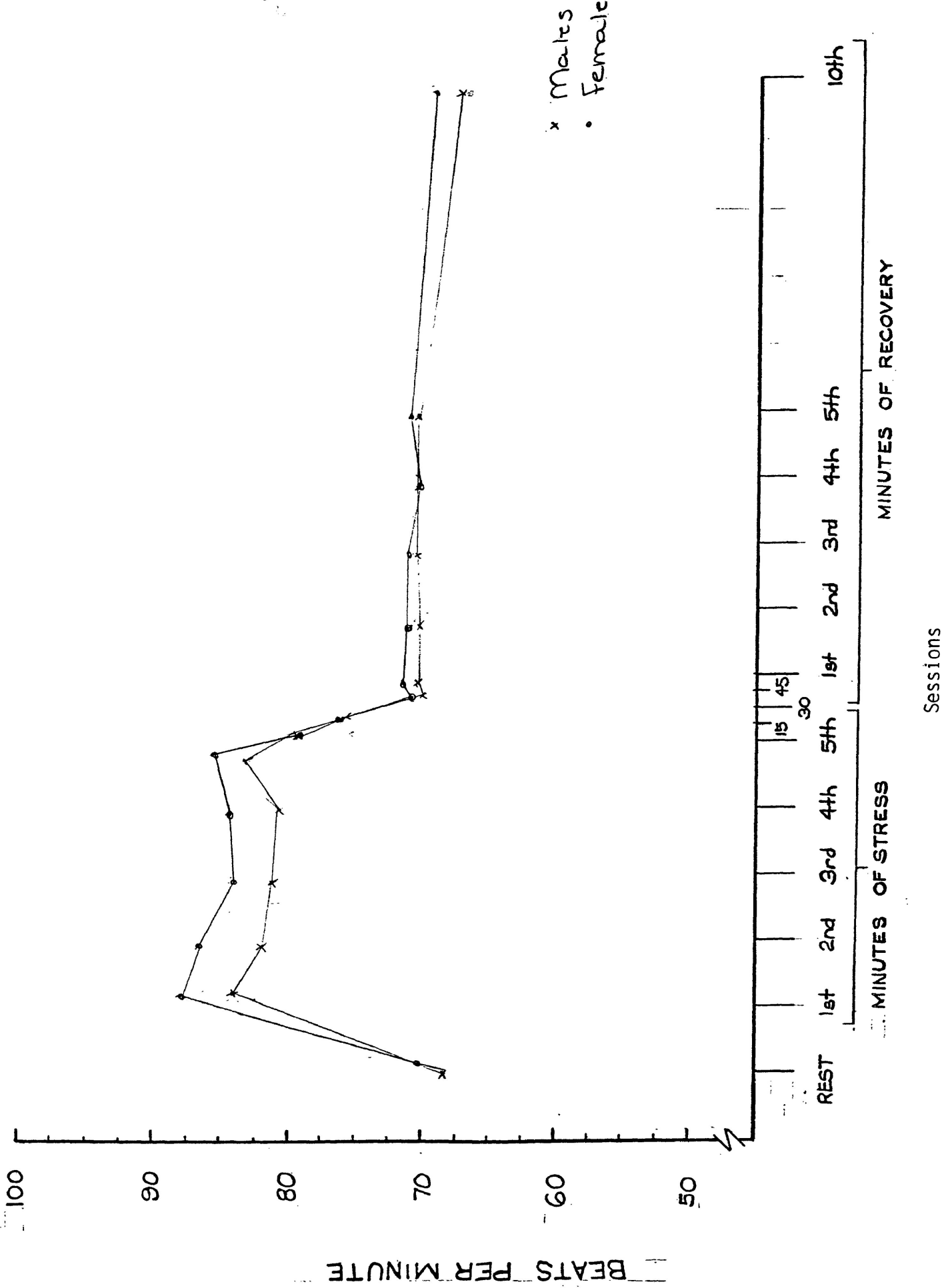
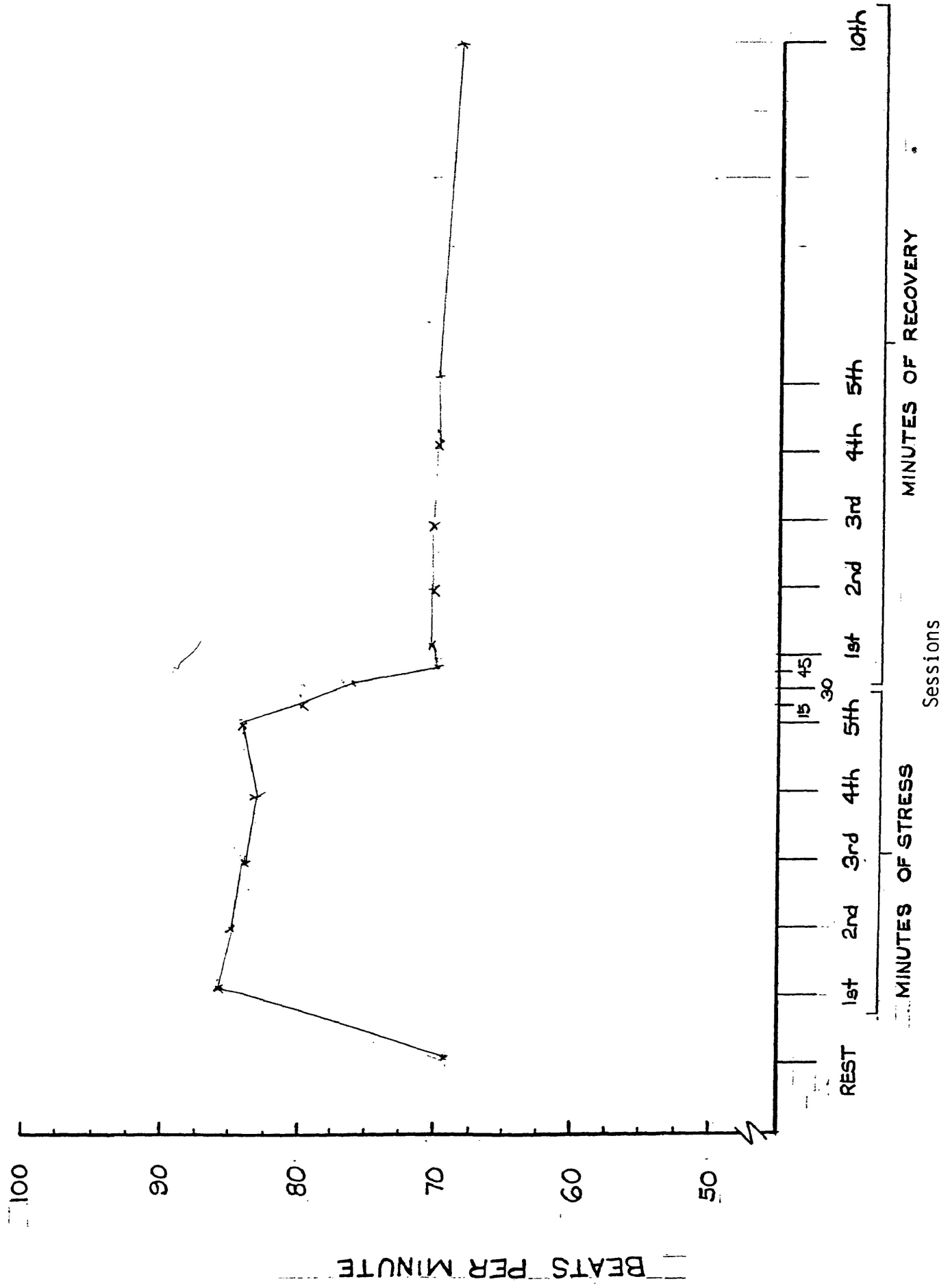


FIGURE 2

Heart Rate and Recovery



during recovery. This approach yields an index of recovery which is independent of baseline differences in HR and differences in reactivity to stress.

No significant partial correlations were obtained between HR recovery and the Jenkins Activity Survey (see Table 2). That is, Type A individuals did not take significantly longer to recover from the psychosocial stressor than did the Type B individuals.

Only AngerIn and Rehearsal scores were found to be significantly related to HR recovery (see Table 2). The sign of the partial correlations indicated that those individuals who obtained high scores on the AngerIn scale (see Appendix) and those individuals who obtained high scores on the Rehearsal scale took significantly longer to recover from the stressor than did individuals scoring low on these scales. It should be noted that the variance accounted for by the AngerIn variable is in actuality only approximately 8 1/2 percent of the total variance.

Since AngerIn scores and Rehearsal scores were significantly correlated with each other [($r=.263$ $p=.05$) see Table 1], the separate items on the Rehearsal scale were investigated 'post hoc' on an exploratory basis to see if there was a common factor explaining both relationships; i.e. to investigate the possibility that the two tests were in actuality measuring the

TABLE 2

PARTIAL CORRELATIONS BETWEEN PERSONALITY MEASURES AND REACTIVITY TO STRESS (MEAN STRESS HR) AND RECOVERY FROM STRESS (1ST 45 SECONDS)

	STRESS	RECOVERY
JENKINS	-.103	.066
REHEARSAL	-.111	.280*
ANGEROUT	-.075	.087
ANGERIN	.007	.290*
COOK	-.099	.146

**=Significant at p=.01

* =Significant at p=.05

same personality factor. Two significant Pearson Correlations were obtained between the Rehearsal questions and the AngerIn scores. AngerIn scores were significantly correlated [($r=.261$, $p=.05$) see Table 3] with question number six: "I often find myself thinking over and over about things have made me angry"; and significantly correlated ($r=.346$, $p=.01$) with question number 10: "I get 'worked up' just thinking about things that have upset me in the past". (See the appendix for all the rehearsal questions).

Since the AngerIn score was significantly related to various questions on the Rehearsal scale, and since both AngerIn scores and Rehearsal scores are both significantly related to HR during recovery, Pearson correlation coefficients (see Table 3) were calculated in order to investigate the relationship between the rehearsal scale questions and HR during recovery. Two of the four questions were also significantly correlated with the AngerIn scores. Therefore, one may assume that although the AngerIn Scale and the Rehearsal Scale are not highly correlated to each other, they do 'tap' a common factor which is important to HR recovery.

FINGER TEMPERATURE

A significant decrease in Finger Temperature occurred from the last minute of the relaxation session and to the last minute

TABLE 3

CORRELATIONS OF EACH QUESTION ON THE REHEARSAL SCALE WITH THE ANGERIN SCALE, AND PARTIAL CORRELATIONS OF EACH QUESTION WITH HR RECOVERY

QUESTION	CORRELATION WITH ANGERIN	PARTIAL CORRELATION WITH HR RECOVERY
1	.207	.314*
2	-.191	-.274*
3	-.027	-.007
4	.174	.211
5	.054	-.053
6	.261*	.285*
7	.245	.107
8	-.082	-.152
9	.069	-.094
10	.346**	.272*
11	.114	.250

**=Significant at $p=.01$

* =Significant at $p=.05$

QUESTIONS:

Question number six: I often find myself thinking over and over about things that have made me angry.

Question number ten: I get "worked up" just thinking about things that have upset me in the past.

of stress session. T-tests revealed a mean finger temperature decrease of 1.73 degrees celsius for the male subjects and a decrease of .745 degrees celsius for the female subjects (see Figure 3). Although the graph (Figure 3) appears to portray significant differences between the males and females t-tests and analysis of covariance found no significant differences between them (see Appendix). The lack of significance could be explained by the large amounts of variability within the subjects. Further analysis found that 15 of the 29 female subjects and 13 male subjects did not recover during the 10 minute recovery session (see Appendix).

None of the personality scales predicted Finger Temperature recovery. This was examined with partial correlations, but no significant relationships were obtained.

POST EXPERIMENT QUESTIONNAIRE

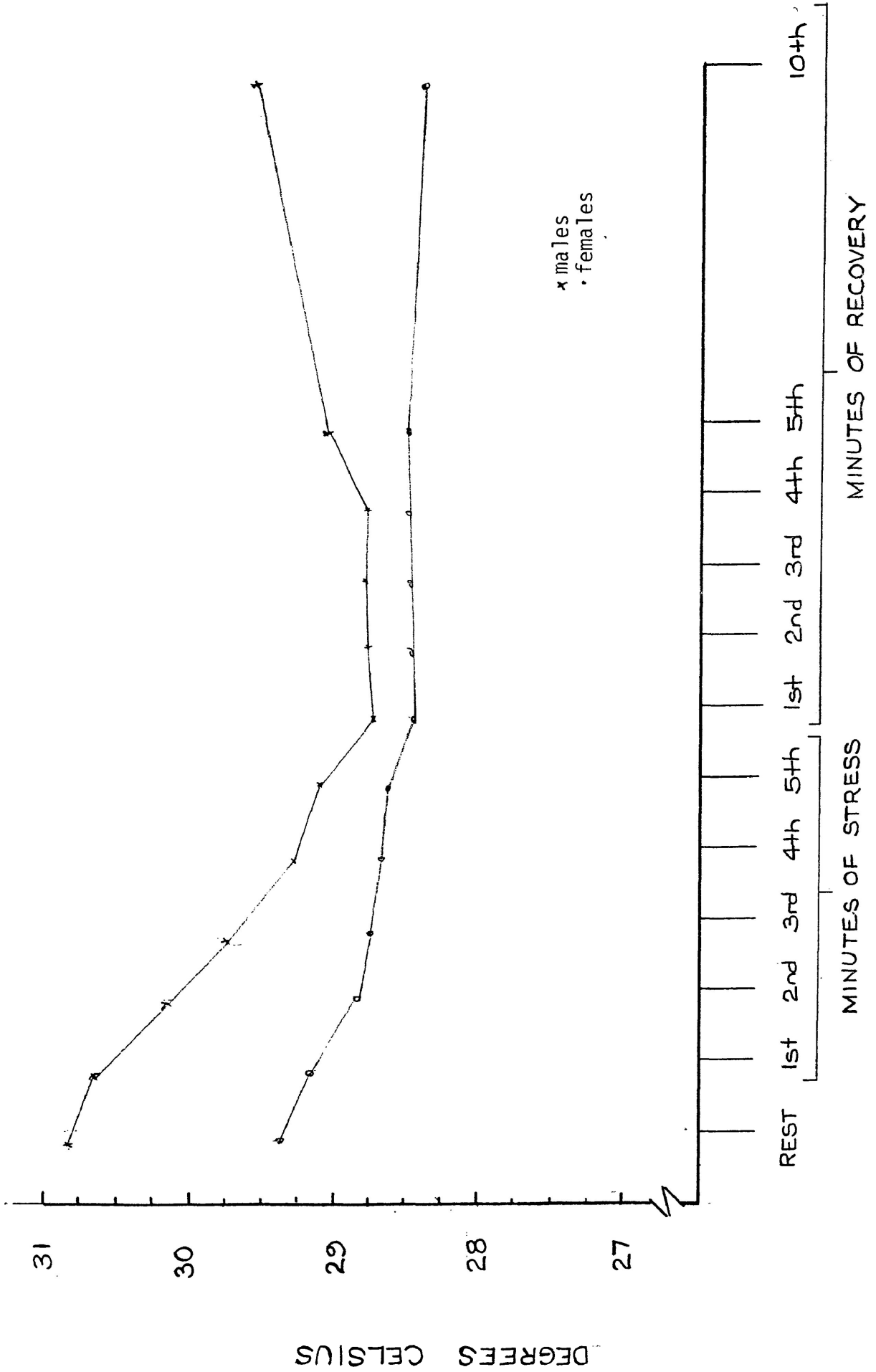
No significant correlations were obtained between heart rate and finger temperature recovery and post experimental questions. Similarly, no sex differences were obtained in the responses to the post experiment questionnaire.

DISCUSSION

The present study was designed to investigate the role of anger and hostility in delayed recovery from stress. The results

FIGURE 3

Finger Temperature Recovery



SESSIONS

clearly identify AngerIn and not AngerOut or general hostility (as measured by the Cook Medley scale) as being related to slower recovery. Subjects who report a tendency to direct anger in exhibit delayed recovery from the stressor. AngerIn has long been recognized as an important predictor of CHD (Haynes et al, 1980); severity of angiographic findings (Dembroski et al, 1985); and borderline hypertension (Schneider et al, 1986). However, its value as a predictor of heart rate recovery after the presentation of a stressor has not been previously reported. Therefore, the findings that those individuals who scored high on AngerIn showed delayed heart rate recovery may have important implications.

But, there is an obvious tendency on the part of many to say that those who hold in anger will be prone to CHD. One must be aware though, that correlation does not infer causation. It is possible that those individuals who hold their anger in are more vulnerable to CHD, but just as plausible is the hypothesis that those individuals who have the predisposition toward CHD hold in their anger because of this predisposition. Or, another explanation is that a third unmeasured variable may be mediating this relationship. Similarly, one must also remember that the AngerIn correlation only accounts for approximately 8 1/2 percent of the variance. Therefore, the major portion of factors contributing to CHD are not accounted for here. Thus, this

relationship may imply that other physiological or psychological variables are at the root of CHD.

One purpose of the present study was to investigate whether anger and hostility mediated the previously reported relationship between TABP and slower recovery. Unfortunately this question could not be answered because no relationship between TABP and recovery was found. Clearly the failure to obtain this relationship is in itself a finding of some interest. A possible explanation for why this relationship was not found here is because of the lack of a social comparison component in the experiment. Jamieson and Lavoie (1987) speculated that A/B differences in recovery may be more likely to appear under conditions which involve later feedback (social comparison) and therefore tap the Type A's greater competitiveness. Thus, since the present experiment did not require the subjects to await for later feedback, the failure to observe a A/B difference is consistent with their speculation.

However, this hypothesis is not totally supported by other findings, since the Jamieson and Kaszor (1986) study which manipulated social comparison also failed to detect Type A effects on recovery. Therefore, it may be more parsimonious to conclude that the Type A effects are either not very robust or that they only appear in certain experimental conditions.

The second purpose of the present study was to investigate the relationship of Rehearsal to recovery. As found with AngerIn scores, those individuals who scored high on the Rehearsal scale exhibited delayed heart rate recovery. The heart rate recovery results, with respect to the Rehearsal scores, support the findings of Jamieson and Roger (1986) who found that those individuals who obtained high scores on the Rehearsal scale exhibited slower heart rate recovery.

In order to investigate whether the AngerIn questions and the Rehearsal questions were in fact measuring the same factor, individual items on the rehearsal scale were examined. It was found that AngerIn scores were significantly correlated with two of the Rehearsal questions (see Table 3) and these were two of the four rehearsal questions which were also correlated with slower heart rate recovery. Thus it appears that the relationship to recovery of both scales is mediated by a common factor. The present findings confirm the suggest of Jamieson and Sekulich (1988) that anger, not cognitive perserveration, is the factor underlying the relationship of the Rehearsal scale to slower recovery.

Although a significant decrease in finger temperature occurred from the last minute of the relaxation session to the last minute of the stress session, no conclusions about

personality factors and recovery could be made from the data. The finger temperature for most of the female subjects did not show any recovery after 10 minutes of the recovery period (see Appendix). Although the higher male resting finger temperature was consistent with recent data (Kappes and Morris, 1982) the lack of finger temperature recovery by the majority of the female subjects and 43% of the male subjects was quite unexpected. The results indicate that further study of finger temperature recovery is required.

The results of this study converge on anger, specifically inner directed anger as a critical factor in delayed HR recovery. Since anger is also associated with increased risk of CHD (Dembroski et al, 1986) and essential hypertension (Diamond, 1982), then delayed recovery may be a mechanism which underlies this relationship.

Although the effect on recovery lasted for a short period of time (approximately 45 seconds), it is not the effect of a single delayed heart rate recovery which has health implications. The repeated occurrences of delayed recovery from stressors may have deleterious consequences. That is, as suggested by Hart and Jamieson (1983) - prolonged arousal may result in more "wear and tear" on that individual. In essence, "wear and tear" can be translated into stress on the heart. That is, because the heart is working in a state of arousal for longer periods of time, it

could be more vulnerable to damage. It is this "wear and tear" upon the individual (or accumulated damage) which may translate to CHD in the future. What must be recognized though, is that the severity of the laboratory stressor. Since a mathematical stressor is not likely as stressful as natural stressors in the environment, it could be inferred that heart rate recovery is more prolonged out of the laboratory as well. Unfortunately, one cannot infer how much of a delay in recovery could be considered as harmful to an individual.

But there is a logical problem in the hypothesis that "wear and tear" may translate into later CHD. One would expect then from this explanation that individuals who exercise a lot, thereby exposing their hearts to more "wear and tear" would also be more predisposing toward future CHD. It is obvious then, that a modification to the "wear and tear" concept is necessary in order to incorporate these paradoxical effects.

In summary, present results add to a growing body of literature pointing to inward directed anger as a deleterious personality trait which may be related to later CHD.

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APPENDIX 1

PARTIAL CORRELATION COEFFICIENTS FOR HEART RATE

	JENKINS	REHEARSAL	ANGEROUT	ANGERIN	COOK
S1	-.132	-.139	-.068	-.005	-.088
S2	-.062	-.075	-.040	.002	-.090
S3	-.095	-.105	-.085	.023	-.106
S4	-.063	-.078	-.028	.063	-.051
S5	-.129	-.119	-.128	-.020	-.128

S1 = First minute of the stress session
S2 = Second minute of the stress session
S3 = Third minute of the stress session
S4 = Fourth minute of the stress session
S5 = Fifth minute of the stress session

APPENDIX 2

PARTIAL CORRELATION COEFFICIENTS
FOR PERSONALITY MEASURES

	JENKINS	REHEARSAL	ANGEROUT	ANGERIN	COOK
REC1A	.179	.367*	.141	.310*	.307*
REC1B	.081	.167	.087	.323*	.204
REC1C	-.141	.214	.056	.194	-.050
REC1D	-.089	.084	-.020	.059	-.221
REC2	-.262	.068	-.114	-.072	-.236
REC3	-.009	.133	-.008	-.062	-.293
REC4	-.246	.109	-.125	-.086	-.249
REC5	-.351*	.030	-.118	-.130	-.431**
REC10	-.153	-.018	-.140	-.363*	-.324*

**=Significant at p=.01

* =Significant at p=.05

APPENDIX 3

STRESSOR QUESTIONS

17 x 9	16 x 8
16 x 3	WHO IS THE V.P. OF USA?
11 x 4	65 -21
129 + 376	WHAT IS THE CAPITAL OF BRITISH COLUMBIA?
WHAT IS THE CAPITAL OF IRAN?	3 x 21
15 x 9	18 x 8
6 x 12	66 $\frac{1}{2}$ 33
413 - 289	NAME THE PREMIER OF MANITOBA
8 x 15	4 x 16
14 x 7	1987 - 768
WHO IS THE FATHER OF PSYCHOLOGY?	17 x 5
13 x 12	45 x 4
9 x 15	1218 - 907
WHAT IS THE CAPITAL OF ALBERTA?	37 + 23 + 11
10 x 11	19 x 9
16 x 4	8 x 6
77 \div 11	12 x 7
20 x 3	HOW MANY STATES ARE THERE IN THE USA?
18 x 7	9 x 9
100 \div 5	26 + 32
WHO IS IS PRIME MINISTER OF ENGLAND?	13 x 4
697 - 126	16 x 11
14 x 8	234 x 56

APPENDIX 4

PLEASE INDICATE THE EXTENT TO WHICH YOU FELT EACH OF THE FOLLOWING EMOTIONS WHILE ANSWERING THE QUESTIONS.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
WORRIED	1	2	3	4
CONFIDENT	1	2	3	4
ANXIOUS	1	2	3	4
ANGRY	1	2	3	4

INSTRUCTIONS: Please indicate how you feel about each item by circling either "True" or "False". If you feel that an item is neither entirely true nor false, please choose the alternative that is most like you. If you haven't been in the situation described, please say how you feel you would behave in that situation.

- | | | |
|---|------|-------|
| 1. I never forget people that make me angry or upset, even about small matters. | TRUE | FALSE |
| 2. I generally don't bear a grudge - when something is over, it's over, and I don't think about it again. | TRUE | FALSE |
| 3. I seldom feel irritable. | TRUE | FALSE |
| 4. I find it hard to get thoughts about things that have upset me out of my mind. | TRUE | FALSE |
| 5. I lose my temper quickly. | TRUE | FALSE |
| 6. I often find myself thinking over and over about things that have made me angry. | TRUE | FALSE |
| 7. I think about ways of getting back at people who have made me angry long after the event has happened. | TRUE | FALSE |
| 8. I seldom snap at people. | TRUE | FALSE |
| 9. I can usually settle things quickly and be friendly again after an argument. | TRUE | FALSE |
| 10. I get "worked up" just thinking about things that have upset me in the past. | TRUE | FALSE |
| 11. I remember things that upset me or make me angry for a long time afterwards. | TRUE | FALSE |

APPENDIX 6 Cook Medley Hostility Scale

PLEASE ANSWER THE FOLLOWING QUESTIONS AS HONESTLY AS POSSIBLE. AN ANSWER OF TRUE INDICATES THAT YOU AGREE WITH THE STATEMENT WHILE AN ANSWER OF FALSE INDICATES THAT YOU DO NOT AGREE WITH THE STATEMENT. PLEASE PLACE YOUR ANSWER BESIDE THE CORRESPONDING QUESTION. ANSWER ALL THE QUESTIONS BELOW. THANK YOU.

- 1. WHEN I TAKE A NEW JOB, I LIKE TO BE TIPPED OFF ON WHO SHOULD BE GOTTEN NEXT TO.
- 2. WHEN SOMEONE DOES ME WRONG I FEEL I SHOULD PAY HIM BACK IF I CAN, JUST FOR THE PRINICPLE OF THE THING.
- 3. I PREFER TO PASS BY SCHOOL FRIENDS, OR PEOPLE I KNOW BUT HAVE NOT SEEN FOR A LONG TIME, UNLESS THEY SPEAK TO ME FIRST.
- 4. I HAVE OFTEN HAD TO TAKE ORDERS FROM SOMEONE WHO DID NOT KNOW AS MUCH AS I DID.
- 5. I THINK A GREAT MANY PEOPLE EXAGGERATE THEIR MISFORTUNES IN ORDER TO GAIN THE SYMPATHY AND HELP OF OTHERS.
- 6. IT TAKES A LOT OF ARGUMENT TO CONVINCCE MOST PEOPLE OF THE TRUTH.
- 7. I THINK MOST PEOPLE WOULD LIE TO GET AHEAD.
- 8. SOMEONE HAS IT IN FOR ME.
- 9. MOST PEOPLE ARE HONEST CHIEFLY THROUGH FEAR OF BEING CAUGHT.
- 10. MOST PEOPLE WILL USE SOMEWHAT UNFAIR MEANS TO GAIN PROFIT OR AN ADVANTAGE RATHER THAN TO LOSE IT.
- 11. I COMMONLY WONDER WHAT HIDDEN REASON ANOTHER PERSON MAY HAVE FOR DOING SOMETHING NICE FOR ME.
- 12. IT MAKES ME IMPATIENT TO HAVE PEOPLE ASK MY ADVICE OR OTHERWISE INTERRUPT ME WHEN I AM WORKING ON SOMETHING IMPORTANT.
- 13. I FEEL THAT I HAVE OFTEN BEEN PUNISHED WITHOUT CAUSE.
- 14. I AM AGAINST GIVING MONEY TO BEGGARS.
- 15. SOME OF MY FAMILY HAVE HABITS THAT BOTHER AND ANNOY ME VERY MUCH.

Directions: Everyone feels angry or furious from time to time, but people differ in the way that they react when they are angry. A number of statements are listed below which people have used to describe their reactions when they feel angry or furious. Read each statement and then circle the number to the right of the statement that indicates how often you generally react or behave in the manner described. There are no right or wrong answers. Do not spend too much time on any one statement.

<u>WHEN ANGRY OR FURIOUS....</u>	<u>Almost Never</u>	<u>Some- times</u>	<u>Often</u>	<u>Alm Alwa</u>
1. I control my temper.....	1	2	3	4
2. I express my anger.....	1	2	3	4
3. I keep things in.....	1	2	3	4
4. I am patient with others.....	1	2	3	4
5. I pout or sulk.....	1	2	3	4
6. I withdraw from people.....	1	2	3	4
7. I make sarcastic remarks to others.....	1	2	3	4
8. I keep my cool.....	1	2	3	4
9. I do things like slam doors.....	1	2	3	4
10. I boil inside, but I don't show it.....	1	2	3	4
11. I control my behavior.....	1	2	3	4
12. I argue with others.....	1	2	3	4
13. I tend to harbor grudges that I don't tell anyone about.....	1	2	3	4
14. I strike out at whatever infuriates me.....	1	2	3	4
15. I can stop myself from losing my temper.....	1	2	3	4
16. I am secretly quite critical of others.....	1	2	3	4
17. I am angrier than I am willing to admit.....	1	2	3	4
18. I calm down faster than most other people.....	1	2	3	4
19. I say nasty things.....	1	2	3	4
20. I try to be tolerant and understanding.....	1	2	3	4
21. I'm irritated a great deal more than people are aware of.....	1	2	3	4
22. I lose my temper.....	1	2	3	4
23. If someone annoys me, I'm apt to tell him or her how I feel.	1	2	3	4
24. I control my angry feelings.....	1	2	3	4

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IN APPENDIX '8' - "JENKINS
ACTIVITY SURVEY" WAS NOT
MICROFILMED. PLEASE REFER, IF
NEED BE, TO THE ORIGINAL THESIS
DEPOSITED IN THE UNIVERSITY
CONFERRING THE DEGREE.

LE TEXTE DEJA PROTEGE PAR LE DROIT
D'AUTEUR DANS L'APPENDICE '8' -
"JENKINS ACTIVITY SURVEY" N'A PAS
ETE MICROFILME. VEUILLEZ VOUS
REFERER AU BESOIN A LA THESE
ORIGINALE DEPOSEE A L'UNIVERSITE QUI
A CONFERE LE GRADE.

Medical research is trying to determine how life style may influence the health of people. This survey is part of such a research effort.

Please answer the questions on the following pages by marking the answers that are true for you. Each person is different, so there are no "right" or "wrong" answers. Of course, all you tell is strictly confidential--to be seen only by the research team. Do not ask anyone else about how to reply to the items. It is your personal opinion that we want. Please use the answer sheet provided to record your responses to the items in this booklet.

Your assistance will be greatly appreciated.

For each of the following items, please circle the number of the ONE best answer on your answer sheet.

1. Do you ever have trouble finding time to get your hair cut or styled?
 1. Never
 2. Occasionally
 3. Almost always
2. Does college "stir you into action"?
 1. Less often than most college students
 2. About Average
 3. More often than most college students
3. Is your everyday life filled mostly by
 1. Problems needing solution
 2. Challenges needing to be met
 3. A rather predictable routine of events
 4. Not enough things to keep me interested or busy
4. Some people live a calm, predictable life. Others find themselves often facing unexpected changes, frequent interruptions, inconveniences or "things going wrong." How often are you faced with these minor (or major) annoyances or frustrations?
 1. Several times a day
 2. About once a day
 3. A few times a week
 4. Once a week
 5. Once a month or less
5. When you are under pressure or stress, do you usually:
 1. Do something about it immediately
 2. Plan carefully before taking any action
6. Ordinarily, how rapidly do you eat?
 1. I'm usually the first one finished.
 2. I eat a little faster than average.
 3. I eat at about the same speed as most people.
 4. I eat more slowly than most people.
7. Has your spouse or some friend ever told you that you eat too fast?
 1. Yes often
 2. Yes, once or twice
 3. No, no one has told me this

8. How often do you find yourself doing more than one thing at a time, such as working while eating, reading while dressing, figuring out problems while driving?
1. I do two things at once whenever practical.
 2. I do this only when I'm short of time.
 3. I rarely or never do more than one thing at a time.
9. When you listen to someone talking, and this person takes too long to come to the point, do you feel like hurrying him along?
1. Frequently
 2. Occasionally
 3. Almost never
10. How often do you actually "put words in his mouth" in order to speed things up?
1. Frequently
 2. Occasionally
 3. Almost never
11. If you tell your spouse or a friend that you will meet them somewhere at a definite time, how often do you arrive late?
1. Once in a while
 2. Rarely
 3. I am never late.
12. Do you find yourself hurrying to get places even when there is plenty of time?
1. Often
 2. Occasionally
 3. Rarely or never
13. Suppose you are to meet someone at a public place (street corner, building lobby, restaurant) and the other person is already 10 minutes late. Will you
1. Sit and wait?
 2. Walk about while waiting?
 3. Usually carry some reading matter or writing paper so you can get something done while waiting?
14. When you have to "wait in line," such as at a restaurant, a store, or the post office, do you
1. Accept it calmly?
 2. Feel impatient but do not show it?
 3. Feel so impatient that someone watching could tell you were restless?
 4. Refuse to wait in line, and find ways to avoid such delays?
15. When you play games with young children about 10 years old, how often do you purposely let them win?
1. Most of the time
 2. Half of the time
 3. Only occasionally
 4. Never
16. Do most people consider you to be
1. Definitely hard-driving and competitive?
 2. Probably hard-driving and competitive?
 3. Probably more relaxed and easy going?
 4. Definitely more relaxed and easy going?
17. Nowadays, do you consider yourself to be
1. Definitely hard-driving and competitive?
 2. Probably hard-driving and competitive?
 3. Probably more relaxed and easy going?
 4. Definitely more relaxed and easy going?

18. How would your spouse (or closest friend) rate you?
1. Definitely hard-driving and competitive?
 2. Probably hard-driving and competitive?
 3. Probably relaxed and easy going?
 4. Definitely relaxed and easy going?
19. How would your spouse (or best friend) rate your general level of activity?
1. Too slow. Should be more active.
 2. About average. Is busy much of the time.
 3. Too active. Needs to slow down.
20. Would people who know you well agree that you take your work too seriously?
1. Definitely Yes
 2. Probably Yes
 3. Probably no
 4. Definitely No
21. Would people who know you well agree that you have less energy than most people?
1. Definitely Yes
 2. Probably Yes
 3. Probably No
 4. Definitely No
22. Would people who know you well agree that you tend to get irritated easily?
1. Definitely Yes
 2. Probably Yes
 3. Probably No
 4. Definitely No
23. Would people who know you well agree that you tend to do most things in a hurry?
1. Definitely Yes
 2. Probably Yes
 3. Probably no
 4. Definitely No
24. Would people who know you well agree that you enjoy "a contest" (competition) and try hard to win?
1. Definitely Yes
 2. Probably Yes
 3. Probably No
 4. Definitely No
25. Would people who know you well agree that you get a lot of fun out of your life?
1. Definitely Yes
 2. Probably Yes
 3. Probably No
 4. Definitely No
26. How was your "temper" when you were younger?
1. Fiery and hard to control.
 2. Strong, but controllable.
 3. No problem.
 4. I almost never got angry.
27. How is your "temper" nowadays?
1. Fiery and hard to control.
 2. Strong, but controllable.
 3. No problem.
 4. I almost never get angry.
28. When you are in the midst of studying and someone interrupts you, how do you usually feel inside?
1. I feel O.K. because I work better after an occasional break.
 2. I feel only mildly annoyed.
 3. I really feel irritated because most such interruptions are unnecessary.

(Remember, the answers on these Questionnaires are confidential information and will not be revealed to officials of your school.)

29. How often are there deadlines in your courses? (If deadlines occur irregularly, please circle the closest answer below.)
1. Daily or more often. 2. Weekly. 3. Monthly. 4. Never
30. Do these deadlines usually
1. Carry minor pressure because of their routine nature?
2. Carry considerable pressure, since delay would upset things a great deal?
31. Do you ever set deadlines or quotas for yourself in courses or other things?
1. No 2. Yes, but only occasionally 3. Yes, once per week or more often.
32. When you have to work against a deadline, is the quality of your work
1. Better? 2. Worse? 3. The same? (Pressure makes no difference)
33. In school do you ever keep two projects moving forward at the same time by shifting back and forth rapidly from one to the other?
1. No, never. 2. Yes, but only in emergencies. 3. Yes, regularly.
34. Do you maintain a regular study schedule during vacations such as Thanksgiving, Christmas, and Easter?
1. Yes 2. No 3. Sometimes
35. How often do you bring your work home with you at night or study materials related to your courses?
1. Rarely or never. 2. Once a week or less often. 3. More than once a week.
36. How often do you go to the school when it is officially closed (such as nights or weekends)? If this is not possible, circle 0.
1. Rarely or never. 2. Occasionally (less than once a week). 3. Once or more a week.
37. When you find yourself getting tired while studying, do you usually
1. Slow down for a while until your strength comes back.
2. Keep pushing yourself at the same pace in spite of the tiredness.
38. When you are in a group, do the other people tend to look to you to provide leadership?
1. Rarely. 3. More often than they look to others.
2. About as often as they look to others.
39. Do you make yourself written lists of "things to do" to help you remember what needs to be done?
1. Never 2. Occasionally 3. Frequently

IN EACH OF THE FOLLOWING QUESTIONS, PLEASE COMPARE YOURSELF WITH THE AVERAGE STUDENT AT YOUR SCHOOL. PLEASE CIRCLE THE MOST ACCURATE DESCRIPTION.

40. In amount of effort put forth, I give

- | | | | |
|---------------------|-------------------------|-------------------------|---------------------|
| 1. Much more effort | 2. A little more effort | 3. A little less effort | 4. Much less effort |
|---------------------|-------------------------|-------------------------|---------------------|

41. In sense of responsibility, I am

- | | | | |
|--------------------------|------------------------------|------------------------------|--------------------------|
| 1. Much more responsible | 2. A little more responsible | 3. A little less responsible | 4. Much less responsible |
|--------------------------|------------------------------|------------------------------|--------------------------|

42. I find it necessary to hurry

- | | | | |
|--------------------------|------------------------------|------------------------------|--------------------------|
| 1. Much more of the time | 2. A little more of the time | 3. A little less of the time | 4. Much less of the time |
|--------------------------|------------------------------|------------------------------|--------------------------|

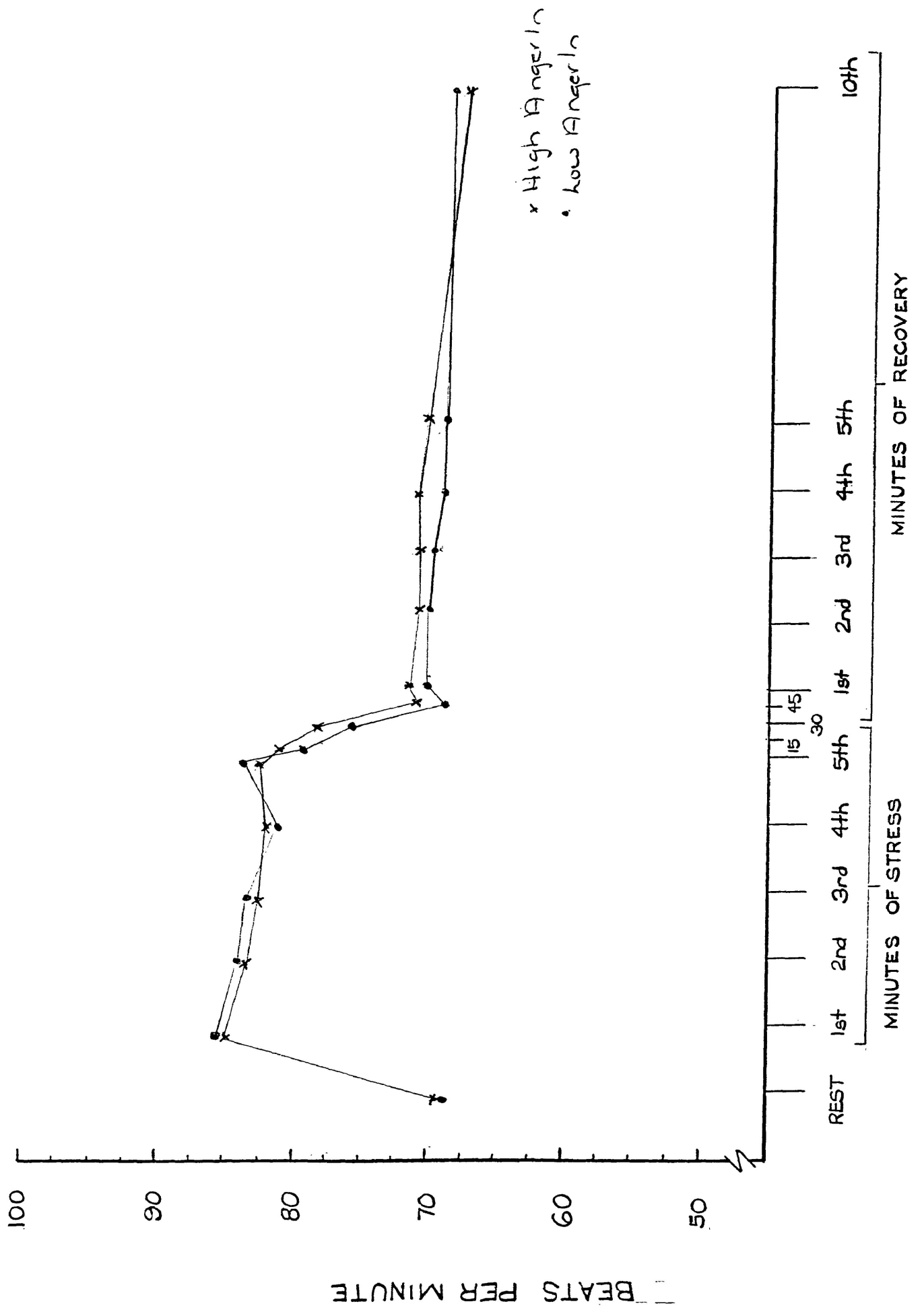
43. In being precise (careful about detail), I am

- | | | | |
|----------------------|--------------------------|--------------------------|----------------------|
| 1. Much more precise | 2. A little more precise | 3. A little less precise | 4. Much less precise |
|----------------------|--------------------------|--------------------------|----------------------|

44. I approach life in general

- | | | | |
|------------------------|----------------------------|----------------------------|------------------------|
| 1. Much more seriously | 2. A little more seriously | 3. A little less seriously | 4. Much less seriously |
|------------------------|----------------------------|----------------------------|------------------------|

High AngerIn Vs. Low AngerIn



APPENDIX 10 CROSS TABULATIONS OF GROUPS BY SEX

	<u>NUMBER OF MALES</u>	<u>NUMBER OF FEMALES</u>	<u>GROUP TOTAL</u>
NO FINGER TEMPERATURE DECREASE	1	5	6
FINGER TEMPERATURE FULLY RECOVERED	2	4	4
FINGER TEMPERATURE PARTIALLY RECOVERED	14	7	21
NO FINGER TEMPERATURE RECOVERY	13	15	28

APPENDIX 11

T-TESTS BETWEEN MALES AND FEMALES FOR FINGER TEMPERATURE

GROUP 1 = MALES
 GROUP 2 = FEMALES

<u>SESSION</u>	<u>GROUP</u>	<u>MEAN</u>	<u>S.D.</u>	<u>F. VALUE</u>	<u>2-TAILL PROBABILITY</u>
RELAX	1	30.77	2.39	1.51	.275
	2	29.31	2.93		
STRESS1	1	30.62	2.28	1.69	.164
	2	29.15	2.97		
STRESS2	1	30.14	2.32	1.46	.318
	2	28.78	2.80		
STRESS3	1	29.72	2.37	1.41	.361
	2	28.71	2.81		
STRESS4	1	29.36	2.46	1.37	.399
	2	28.65	2.89		
STRESS5	1	29.05	2.56	1.40	.371
	2	28.56	3.03		
REC1	1	28.71	2.72	1.30	.483
	2	28.35	3.10		
REC2	1	28.74	2.95	1.28	.518
	2	28.38	3.33		
REC3	1	28.93	3.11	1.22	.591
	2	28.38	3.44		
REC4	1	28.91	3.27	1.09	.818
	2	28.34	3.41		
REC5	1	29.01	3.36	1.04	.916
	2	28.33	3.43		
REC10	1	29.44	3.13	1.23	.583
	2	28.17	3.47		

APPENDIX 12

ANALYSIS OF COVARIANCE

FINGER TEMPERATURE DURING LAST MINUTE OF POST STRESS BY SEX WITH
 FINGER TEMPERATURE DURING RELAXATION

<u>SOURCE OF VARIATION</u>	<u>SUM OF SQUARES</u>	<u>DF</u>	<u>M.S.</u>	<u>F.</u>	<u>SIGN. OF F.</u>
COVARIATES OF FINGER TEMP. RELAXATION	487.005	1	487.005	173.628	0.0
MAIN EFFECTS SEX	1.191	1	1.191	.425	0.517
EXPLAINED	48.196	2	244.098	87.026	0.0
RESIDUAL	157.073	56	157.073	2.805	
TOTAL	645.269	58	11.125		