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CARDIOVASCULAR REACTIVITY IN MEN AS A FUNCTION OF MASCULINE GENDER ROLE STRESS, TYPE-A BEHAVIOR, AND HOSTILITY

by

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ABSTRACT

Previous research on the construct and measurement of Masculine Gender Role Stress (MGRS) validates the assumption of sex differences in the appraisal of stressful situations. The present study was designed to extend the validity of the construct, MGRS, by examining its association with a set of physiological responses known as cardiovascular reactivity. Generally, such reactivity is measured in terms of systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR). Cardiovascular hyper-reactivity has been implicated as the major pathogenic mechanism through which psychological variables such as Type-A behavior and hostility may increase one's risk of coronary heart disease. A major underlying assumption of the dissertation is that the same gender-role socialization which leads to MGRS may also underlie development of Type-A behavior and hostility, and most importantly, cardiovascular hyper-reactivity.

Forty-eight male undergraduate students volunteered to complete questionnaires measuring MGRS, Type-A behavior, and hostility, and participated in a one-hour laboratory session in which cardiovascular reactivity was assessed. Measures of SBP, DBP, and HR were obtained during consecutive phases of the assessment: (1) relaxation baseline, (2) the first stressor, (3) relaxation baseline, (4) the second stressor. All subjects were exposed to both stressors, a Cold Pressor Task (CPT) and a structured Masculine Threat Interview (MTI) in counter-balanced order. Subjects were divided into equal groups representing lower, middle, and upper thirds of MGRS.

Results indicated that MGRS scores were significantly related to cardiovascular reactivity, specifically the SBP response. Thus, higher levels of MGRS were associated with proportionate increases in SBP reactivity. Within-subjects comparisons demonstrated no difference between stressors, the CPT versus the MTI, for SBP reactivity. Regression analyses indicated that MGRS scores were a better predictor of SBP reactivity than either Type-A behavior or hostility. Together, all three psychological variables accounted for 20% of the variance of systolic reactivity; however MGRS alone accounted for 17% of that variance. These findings add considerable support to the theoretical assumption that gender role socialization plays an important role in men's appraisal of psychological stress, and that such stress has measurable (harmful) effects on cardiovascular physiology.

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It was the encouragement of friends and family which kept me sane through the ups and downs involved in graduate education. Many thanks go to , , , , , and for reminding me of life beyond the dissertation.

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INTRODUCTION

This dissertation is primarily concerned with the empirical relationship between cardiovascular reactivity and masculine gender role stress. Previous research relevant to both of these constructs will be reviewed thoroughly. It will be proposed that men who report higher levels of gender role stress may be more reactive, in terms of cardiovascular physiology, to stressful environmental events. A controlled experiment will address this hypothesis; results of which would serve to extend, or limit, validity of the construct "masculine gender role stress."

Secondary consideration is given to Type-A behavior and hostility because of evidence linking these variables to cardiovascular reactivity and coronary heart disease, and because of the obvious similarity between Type-A behaviors and "masculine" behaviors. Perhaps masculine gender role stress (MGRS) would eclipse Type-A behavior and hostility in predicting cardiovascular reactivity among men. Therefore, statistical analyses will examine separate and joint effects of MGRS, Type-A behavior, and hostility, in the prediction of cardiovascular reactivity. Such inter-relations reflect the broader theoretical base from which this dissertation developed; specifically, with regard to gender differences in heart disease morbidity and mortality that show men are at much greater risk.

BACKGROUND OF THE PROBLEM

Men have a life expectancy that is eight years shorter than women and experience higher death rates at virtually every age for almost all causes of death (National Center for Health Statistics, 1983). For six major categories of somatic illness leading to death, the ratio of male/female mortality ranges from 2:1 to 4:1. Likewise, the death rates from accidents, homicide, and suicide indicate that males lead females by three-to-one (Waldron & Johnson, 1976). While these data are derived from population statistics in the United States, similar sex differentials prevail in most developed nations.

Two explanations have been proposed to account for the sex differential in mortality: (1) the hypothesis that women are biologically "more fit" than men (e.g., Hammoud, 1965; McMillen, 1979; Potts, 1970), and (2) the psychosocial or "lifestyle" hypothesis that men behave in ways more damaging to their health (Lopez, 1983; Preston, 1970; Retherford, 1975; Verbrugge, 1980). Since 1900, differences in life expectancy favoring women have increased from two years to eight years (Johnson, 1977), and it seems unlikely that such increase, in so few generations, could be entirely ascribed to genetic changes in gender biology. Even if one adopts the assumption that biology makes generous contributions to male-female differences, a strong case can be made for

exploring psychosocial perspectives with regard to gender role behaviors (e.g., Fausto-Sterling, 1985). For example, Waldron (1974, 1976) points out that the largest differences between male and female death rates occur in causes of death (e.g., heart disease, lung cancer, liver disease, accidents) that are linked to behaviors encouraged or more accepted in males (e.g., Type A behaviors, fatty diet, cigarette smoking, alcohol consumption, hazardous work). Risk factors for heart disease, in particular, appear related to male gender role behaviors (Platt, 1984). In fact, except for younger age groups in which accidents predominate, the primary contributor in the sex mortality differential is coronary heart disease (Wingard, 1984), with men at greater risk.

Several types of "controllable" and "uncontrollable" risk factors for coronary heart disease (CHD) have been identified through epidemiological research. Age (being older), sex (male), and heredity (family history of heart disease) are the major uncontrollable factors which increase the risk of developing CHD. Cigarette smoking, hypertension and hyperlipidemia are the major controllable risk factors having strong empirical associations with CHD. Additional risks of CHD are associated with obesity and diabetes, with somewhat less agreement regarding relative risk (Kannel, 1983; Keys, 1970; The Pooling Project Research Group, 1978).

In addition to the traditional physical risk factors, several categories of psychosocial variables have been associated with CHD. The Type-A behavior pattern, low socio-economic status, work overload, life dissatisfaction, acute and chronic stressful life events, and sustained negative affective states (anxiety, depression, anger, and neuroticism) all have empirical association to CHD (Jenkins, 1971, 1982; Kannel, 1983). It should be noted, however, that the strongest evidence is found in the relation between CHD and Type-A behavior (Rosenman, 1983). Friedman and Rosenman (1959) introduced the concept of Type-A to describe a behavior pattern they found typical of coronary patients. The Type-A Behavior Pattern (TABP) has been characterized by high levels of aggressiveness, ambitiousness, competitive drive, hostility, overcommitment to work, and a chronic sense of time urgency. As noted by Jenkins (1976, p. 1034) the TABP is "a style of behavior with which some persons habitually respond to circumstances that arouse them."

Studies that have examined sex differences for the TABP find a greater percentage of men are diagnosed as Type-A, and that men score significantly higher than women on Type-A assessments (Blumenthal, Williams, Williams & Wallace, 1980; Haynes, Levine, Scotch, Feinleib & Kannel, 1978; Waldron, 1978). This sex difference in the prevalence of Type-A behavior may help explain the increased risk of CHD in males. Waldron (1978), re-analyzing data from studies by

Rosenman and Friedman, has found that the prevalence of CHD is approximately equal in Type-B men and women. This seems to imply that a significant portion of the higher CHD rates in males can be accounted for by the fact that men exhibit more Type-A behavior than women.

Evidence for a genetic contribution to Type-A is weak. Rahe and Rosenman (1975) studied male monozygotic (MZ) and dizygotic (DZ) twin pairs and found that A-B behavior, based on the structured interview, showed no heritability. In another study of male and female MZ and DZ twins, assessed for Type-A on the Jenkins Activity Survey, scores on the factor "hard-driving competitiveness" did show evidence of heritability, but overall Type-A scores did not (Matthews & Krantz, 1976). On the basis of a review of numerous studies that examined sex differences in behavior, Maccoby and Jacklin (1974) concluded that males show more aggressiveness and competitiveness than females. These two traits are both important components of the TABP. Along these lines, O'Neil (1982) has cataloged numerous "male" traits or attitudes, many of which overlap with the construct of Type-A, and proposes that these are acquired by men though gender role socialization.

Many researchers have suggested that masculine gender socialization could be a major factor in the relationship between psychosocial variables, such as Type-A, and the development of coronary heart disease. Psychobiological

studies carried out by Frankenhaeuser (1980), for example, suggest that "psychological factors related to sex role are more important than biological factors as determinants of different neuroendocrine stress responses in males and females" (p. 219). Chesney (1983) cites research on the occupational correlates of Type-A behavior which is quite "consistent with the hypothesis that higher prevalence of type A behavior in males results from social modeling and reinforcement of male sex-role stereotypes" (p. 83). In a review of the research on sex roles and psychophysiological disorders, Platt (1984) offers considerable evidence that gender role behaviors contribute to the sex differential demonstrated in coronary heart disease.

Thus, there is a great deal of circumstantial evidence from several lines of research to implicate the masculine gender role in the development of Type-A behavior, coronary heart disease and, ultimately, mortality. However, previous research has failed to address directly (1) which aspects of the masculine gender role are pathogenic, or stressful; (2) how to measure the psychological stress associated with the masculine role; and (3) whether the construct of "masculine gender role stress" has any empirical validity. These are the main issues dealt with in the first section of a two-part review of related research. The conceptualization and measurement of "masculine gender role stress" is presented, along with evidence for its validity and factor structure.

The second section of the literature review below will focus on cardiovascular reactivity as a potential mechanism through which Masculine Gender Role Stress could operate to increase one's risk for coronary heart disease. Recent research has implicated cardiovascular reactivity as the physiological pathway by which psychological stress might lead to heart disease (Krantz & Manuck, 1984; Obrist, 1981). Specifically, hyper-reactivity probably contributes to the pathogenic process of long-term atherosclerosis and plaque formation (Clarkson, Manuck & Kaplan, 1986; Van Doornen & Orlebeke, 1982). Consequently, to the degree that Masculine Gender Role Stress is related to cardiovascular reactivity, it may account for some of the greater risk exhibited by men for coronary heart disease.

REVIEW OF RELATED RESEARCH

MASCULINE GENDER ROLE STRESS

Conceptualization

Only recently have concerns been expressed regarding the maladaptive and stress-producing aspects of traditional gender roles which are assigned to men. In one of the first books of its kind, Herb Goldberg (1976) warned men of "the hazards of being male". A number of theorists have indeed offered support to the hypothesis that at least some aspects of masculine gender role socialization can have maladaptive consequences. Pleck (1981) has pointed out that males who violate masculine gender role norms are subject to greater social condemnation than females. Further, men who fail to live up to their own perceptions of the "ideal male" suffer self-devaluation and poor personal adjustment (Deutch & Gilbert, 1976). Other reviewers, notably Doyle (1983) and Fasteau (1975), have theorized about the stressful effects of a masculine sex-typed emphasis on competition for power and control, success at all costs, and a restricted ability to express emotions. O'Neil (1982) has hypothesized that men's fears of appearing feminine, or failing at masculine tasks, produces excessive conformity to the dysfunctional attributes of the male role.

Yet, surprisingly little theory or research regarding stressful aspects of gender role stereotypes has been linked

to empirical paradigms in the "stress and coping" literature (cf., Goldberger & Breznitz, 1982; Lazarus & Folkman, 1984). Behavioral research on stress has remained relatively blind to the possibility of significant gender differences in the appraisal of specific events as stressful. The literature fails to offer published measures to differentiate stress according to gender, nor are there systematically studies that identify situations which might be more stressful for men than women.

Therefore, for the past two years, Dr. Richard Eisler and I have been been conducting systematic research which addresses these issues. Our efforts have led to development of the construct, Masculine Gender Role Stress (MGRS), along with a new scale for its measurement. The definition and measurement of MGRS is operationalized in terms of a man's cognitive appraisal of gender-related events as stressful. Such situations include thoughts and behaviors, as well as environmental events. Based on traditional gender roles, this implies that men will experience stress when they judge themselves unable to cope with the imperatives of the male role, and/or when a situation is appraised as requiring "unmanly" or feminine behaviors.

Conceptualization of MGRS is based on assumptions of stress and coping that have been most clearly articulated by Richard Lazarus (Lazarus 1966, Lazarus, 1977). Within his "transactional" model, a central role is given to cognitive

processes in an individual's appraisal of environmental events as stressful. The term "cognitive appraisal" refers to an evaluative process by which the person imbues an event with meaning, and thus determines the quality and intensity of emotional reactions to specific situations. With MGRS research, we hoped to extend this paradigm to account for gender role influences in the appraisal of several internal, behavioral, and environmental events. For clarification, an overview is provided below of scale development, preliminary validation, and the factor components which underlie MGRS. [1]

Scale Development

The initial pool of items was generated empirically, using a sentence completion technique to elicit stressful attributes associated with "being a man." Based on this data, 105 items were written for an initial version of the MGRS scale; each item representing a potentially stressful situation for men. The 105 initial items were then given to fifty trained "judges" who were asked to rate each item for the degree of stress that the situation might generally elicit in men and women (separately). From these ratings, two selection criteria were established. First, items were retained only if rated as significantly more stressful for

1. An article detailing the initial conceptualization of masculine gender role stress, the scale development, preliminary validation, and factor analytic data has been published elsewhere (Eisler & Skidmore, 1987).

men than women. Note that this eliminates many situations typically considered stressful; that is, events which are equivalently stressful for both men and women. Second, the mean rating of "stressful for men" on each item had to be in the moderate to high range, so that each item represents a situation which is not only more salient for men than women but, indeed, is more stressful.

Preliminary Validation

A total of 66 items were selected by the above criteria to measure Masculine Gender Role Stress. The questionnaire was structured for respondents to rate each item in terms of its personal impact (as if they were in the situation), with a Likert-type scale ranging from "not at all stressful" to "extremely stressful." This preliminary version of the MGRS scale, along with other questionnaires described below, was administered to 173 undergraduates, 82 males and 91 females, at Virginia Polytechnic Institute and State University. A comparison between sexes utilized the responses from all 173 subjects, whereas comparisons of MGRS to masculinity, anger, and anxiety primarily concern hypotheses regarding men and, therefore, were based on responses from the 82 males.

Sex Differences on MGRS: Stress associated with gender roles would, by definition, be hypothesized as different for each sex. Situations that pose a threat to masculinity should be appraised as more stressful by men than by women.

This assumption was tested by comparing male versus female responses on the MGRS scale. The men scored significantly higher on the MGRS scale than women. Thus, the MGRS scale does identify specific events which are generally appraised as more stressful by males than females.

Masculinity and MGRS: At this point it is important to distinguish the concept of Masculine Gender Role Stress from the construct of "masculinity" used by Bem (1981) and Spence (Spence & Helmreich, 1978). They have defined and measured masculinity in terms of characteristics deemed socially desirable for men (Bem, 1974; Spence, Helmreich & Stapp, 1974). Individuals are categorized as "masculine" to the degree that their self-perceptions include traditional male attributes, such as autonomy, confidence, assertiveness, and instrumentality. Thus, these measures of "masculinity" are based on global self-perceptions of socially-desirable male traits. Conversely, Masculine Gender Role Stress refers to an individual's appraisal of specific states, behaviors, or situations as stressful, or undesirable.

To test our distinction between MGRS and masculinity, we compared MGRS scores to responses on Spence's measure of masculinity, the Personal Attributes Questionnaire (Spence, et al., 1974). As expected, scores on the MGRS scale were not significantly related to masculinity; the correlation was, in fact, near zero ($r = .08$).

This lack of association between the MGRS scores and Spence's measure of masculinity can be viewed as supportive of the MGRS construct. It appears that men who score high on traditional masculine traits need not, as a result, be considered at increased risk for maladaptive behavior. Popular writers and theoriticians have globally implicated the masculine role in a variety of stress syndromes and behavior disorders from "burnout" to cardiovascular disease (Doyle, 1983; Goldberg, 1976; O'Neil, 1982; Pleck, 1981). By contrast, the present findings are supportive of others who find trait measures of masculinity (e.g., both Spence's and Bem's scales) to be related to positive personal and social adjustment (Bassoff & Glass, 1982; Taylor & Hall, 1982; Whitley, 1983). While many aspects of masculinity probably are adaptive (contrary to the "androgyny" theories of Bem and Spence), the MGRS scale was intended to delineate only those aspects of masculine socialization which lead to personal distress and psychosocial dysfunction.

Anger, Anxiety, and MGRS: Evidence that scores on the MGRS scale do, indeed, reflect "stress" was demonstrated in correlations of MGRS with anger and anxiety. Responses to Siegel's (1986) Multidimensional Anger Inventory, as well as Spielberger's State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) were compared to MGRS scores. Men who scored high on MGRS were likely to report increased anger ($r = .54$, $p < .01$) and, to a lesser degree,

increased anxiety ($r = .23$, $p < .05$). Clearly, MGRS scores are significantly associated with some emotional distress. The moderately high correlation of MGRS scores with anger, and to a lesser extent with anxiety, demonstrates that at least some aspects of masculine gender role identification are stressful, and probably maladaptive.

Factor Analytic Findings

Given the supportive results above, the MGRS scale was refined by retaining only the stronger items, based on item-total correlations. This procedure reduced the scale from 66 to 43 items. While defining MGRS as a unitary construct, we were also interested in whether the items might represent a group of meaningful components, or factors. Hence, our latest MGRS scale was administered to 150 undergraduate male subjects. Using principle components analysis, five factors were extracted. Each factor contained 7 to 9 items, with loadings that ranged from 0.33 to 0.70. Three items were discarded due to their low factor loadings and conceptual incongruence; leaving 40 MGRS items in the factor analysis. The pattern matrix containing all 40 items, and respective factor loadings are shown in Table 1 (pp. 16-17).

Factor 1 was defined as Physical Inadequacy, and made of items reflecting an inability to meet masculine standards of physical fitness, sexual prowess and "manly" appearances. Factor 2, Emotional Inexpressiveness, portrays situations

that require the expression of "tender" emotions, including the expression of love, fear, and hurt feelings. Factor 3 suggests Subordination to Women. Items that comprise this factor place one in the position of being outperformed by women (at work or in a game), having a female boss, letting a woman take control, or being with women who are more successful or make more money. Factor 4 appears to reflect Intellectual Inferiority by clustering on situations which question one's rational ability, or demonstrate uncertainty, lack of ambition, and indecisiveness. Factor 5, labeled Performance Failure, concerns potential failures in two different spheres, work and sex. The finding that work and sex group together into one factor demonstrates that these activities are probably highly related in male perceptions of achievement. Items regarding work include unemployment, not making enough money, lacking occupational skills, not getting promoted, and being fired. Items in the sexual category include "failure" to perform, respond, or become sexually aroused at will.

Table 1: MGRS Factor Analysis Pattern Matrix

Item	Loading
FACTOR 1	
Feeling that you are not in good physical condition	.62
Not being able to find a sexual partner	.61
Having your lover say that she/he is not satisfied	.56
Being perceived by someone as "gay"	.48
Losing in a sports competition	.48
Being perceived as having feminine traits	.47
Appearing less athletic than a friend	.45
Being compared unfavorably to men	.39
Knowing you cannot hold your liquor as well as others	.39
FACTOR 2	
Telling your spouse that you love her/him	.54
Telling someone that you feel hurt by what they said	.53
Admitting that you are afraid of something	.50
Having your children see you cry	.44
Talking with a woman who is crying	.39
Comforting a male friend who is upset	.38
Having a man put his arm around your shoulder	.37
FACTOR 3	
Being outperformed at work by a woman	.69
Having a female boss	.67
Letting a woman take control of the situation	.67
Being married to someone who makes more money than you	.64
Being with a women who is more successful than your	.58
Being outperformed in a game by a woman	.57
Needing your spouse to work to help support the family	.48
Admitting to your friends that you do housework	.46
Being with a woman who is much taller than you	.33

continued

Table 1: (continued)

Item	Loading
FACTOR 4	
Having to ask for directions when you are lost	.64
Working with people who seem more ambitious than you	.60
Talking with a "feminist"	.57
Having people say that you are indecisive	.51
Having others say that you are too emotional	.46
Working with people who are brighter than yourself	.44
Staying home during the day with a sick child	.33
FACTOR 5	
Being unemployed	.70
Not making enough money	.67
Finding you lack the occupational skills to succeed	.64
Being unable to perform sexually	.51
Being too tired for sex when your lover initiates it	.51
Being unable to become sexually aroused when you want	.50
Getting passed over for a promotion	.50
Getting fired from your job	.41

Summary

While a theoretical base exists to conceptualize stress or maladaptation associated with the masculine gender role, the present literature review found no empirical research prior to the work of Eisler and Skidmore (1987). Therefore, findings from our research were reviewed in some detail.

A new scale was developed to measure the construct of Masculine Gender Role Stress (MGRS), and the psychometric steps involved in item generation and scale refinement were described above. Data were presented to substantiate the preliminary validation of the MGRS scale. These findings support the hypotheses that MGRS scores (1) significantly distinguish men from women, (2) are unrelated to global measures of sex-typed masculinity, and (3) are significantly associated with at least two measures of self-rated stress, i.e., anger and anxiety.

The stressful situations represented on the MGRS scale include a variety of cognitive, behavioral, and environmental events associated with the male gender role. Results of factor analysis demonstrate that these gender role concerns tend to cluster in five particular domains. Specifically, men are prone to stress in situations that reflect (1) physical inadequacy; (2) emotional inexpressiveness with regard to the "tender" emotions; (3) subordination to women, involving situations where woman are

dominant, or more successful; (4) feelings of intellectual inferiority, which threatens one's perceptions of control and rational decisiveness; and (5) performance failures in work or sex, areas of a man's life which appear to require instrumental success for maintenance of self-esteem. Additional parameters of the specific scale used to assess MGRS are described in the appropriate section of the METHOD chapter.

While MGRS reflects specific situations that clearly are psychologically stressful for men, it remains to be seen whether the stress associated with masculine role conflict will have harmful physiological or somatic consequences. A major goal of the dissertation is to draw a connection from MGRS to specific health-risk, via cardiovascular reactivity.

CARDIOVASCULAR REACTIVITY

Conceptualization

Measurement of individual differences in response to environmental stressors is hardly a new concept. Exercise stress testing, glucose tolerance, and tests of muscle strength have been used routinely by the medical community for many years. Reaction time tests, puzzle solving, and perceptual-motor tasks have similarly been employed by psychologists. And researchers in psychophysiology have long been concerned with the measurement of individual differences in biobehavioral responses (Andreassi, 1980). It is well established that environmental stimuli often evoke substantial responses of the autonomic and neuroendocrine systems, and that the magnitude of response varies considerably among individuals. Only recently, however, with the growth of multidisciplinary research in behavioral medicine (Gentry, 1984) and the increased understanding of cardiovascular psychophysiology (Obrist, 1981), has concerted scientific effort been focused on research attempting to categorize individuals according to hyper-responsive/hypo-responsive cardiovascular patterns as being more or less at risk for disease. In the first of its kind, a working conference titled "Stress, Reactivity and Cardiovascular Disease" was sponsored by the National Heart, Lung and Blood Institute and the University of Pittsburgh in

April 1984. The calling of this conference by the NHLBI is strong testimony of the importance biomedical and behavioral researchers assign to the role of reactivity-to-stress in the etiology of cardiovascular disease.

Association with Cardiovascular Disease

Several hypotheses have been offered and much recent data has been advanced linking physiological reactivity and disease. In particular, it is proposed that exaggerated physiological responsiveness to environmental stressors may lead to development or clinical expression of cardiovascular disorders, especially coronary heart disease (CHD) and essential hypertension (Manuck & Krantz, 1986). It is commonly thought that psychosocial factors influence the development of CHD through sympathetic-adrenal-medullary and pituitary-adrenal-cortical pathways to the endocrine and cardiovascular systems. One proposal is that repeated physiological reactions involving excessive heart rate and/or pressor responses to psychological stressors promote arterial injury through hemodynamic forces such as turbulence and sheer stress (Manuck, Kaplan, Clarkson, 1983). Additionally, direct biochemical sources of injury may follow from an increased output of certain endocrine substances, such as catecholamines and corticosteroids, which may exert toxic effects on the coronary arteries (Haft, 1974). Further, increased levels of circulating catecholamines may influence coronary atherogenesis

indirectly through mobilization of serum lipids and platelet aggregation (Schneiderman, 1983).

If the foregoing are pathways for the harmful effects of cardiovascular reactivity, the contribution to risk would be greatest among individuals exhibiting more pronounced psychophysiological responsivity (i.e., "hot" reactors). Evidence that hyperreactivity does indeed place individuals at greater risk for CHD may not be voluminous, but it is compelling. Supportive data can be presented from animal experiments, retrospective and prospective investigations with humans, and results of experimental studies examining physiological reactivity in persons with coronary-prone behavior or personality patterns (Type-A and hostility).

Regarding animal models, two studies have been published that have direct relevance to the issue of reactivity differences and development of CHD. In the first investigation (Manuck, Kaplan, Clarkson, 1983), male monkeys were identified as either "high" or "low" heart rate (HR) reactors, and fed a moderately atherogenic (high fat) diet for 22 months. After necropsy, the high HR reactors were found to have developed nearly twice the coronary artery atherosclerosis of their low HR reactive counterparts. In addition, high and low reactors did not differ significantly before the experiment on measures of HR, blood pressure, or serum lipid concentrations, suggesting that the reactivity-atherosclerosis association was largely independent of other

risk factors commonly associated with atherogenesis and CHD. A second study by the same investigators (Manuck, Kaplan & Clarkson, 1985) exposed female monkeys to the same (above) experimental procedures. As in male animals, the high HR reactive females had significantly more coronary artery atherosclerosis than did less reactive females. Again, high and low reactors did not differ on baseline heart rate, blood pressure, or serum lipid measurements. In sum, these studies demonstrate a cause-effect relationship between cardiovascular reactivity and atherosclerosis, independent of other known risk factors.

Several retrospective studies comparing reactivity levels in persons with and without CHD have also been reported (Corse, Manuck, et al., 1982; Dembroski, MacDougall & Lushene, 1979; Krantz, Schaeffer, et al., 1981; Nestel, Verghese & Lovell, 1967; Shiffer, Hartler, et al., 1976; Sime, Buell & Elliot, 1980). In general, these experimental investigations demonstrate a heightened reactivity (usually increased systolic blood pressure) to laboratory stressors among patients with histories of angina pectoris or previous infarction, compared with non-CHD patients or non-patient controls. The experimental tasks employed in these studies were either stressful interviews (e.g., the structured interview for Type-A assessment) or timed intellectual tests (e.g., mental arithmetic, Raven's progressive matrices). While some of these studies could be faulted on a variety of

methodological grounds (see Manuck & Krantz, 1986), overall they provide suggestive evidence for the association of cardiovascular reactivity with coronary heart disease. Of course, retrospective studies cannot demonstrate cause-effect relationships.

There is, however, one published prospective study on cardiovascular reactivity and development of CHD. Keys, Taylor, and colleagues (1971) found that the magnitude of diastolic blood pressure responses to the cold pressor task (immersion of hand in cold water) was significantly associated with development of CHD at a 23-year follow-up. In fact, the prediction of subsequent disease from subjects' diastolic reactivity in this investigation was greater than the predictive power of any other traditional risk factor.

Further, there is a large number of well-conducted studies showing a relation between coronary prone (Type-A) behavior and various indices of cardiovascular reactivity. According to Manuck and Krantz (1986), there are approximately 50 published studies comparing the physiologic responses of Type-A and Type-B individuals to diverse psychological and physical stressors. The subjects in these investigations range from children, adolescents and college students to working class and professional adults and CHD patients. In the majority of studies, Type-A individuals are found to exhibit reactivity of blood pressure, heart rate, and plasma catecholamines or cortisol, relative to

Type-B subjects, when exposed to stressful laboratory tasks. These effects are seen most consistently where subjects are faced with harassment, threat of failure, competitive demands, and during interpersonal interactions (Krantz & Manuck, 1984). Other factors, such as family history of heart disease, various demographic variables, and the gender-appropriateness of experimental tasks, also appear to modulate reactivity/Type-A relations (Williams & Lane, 1982; MacDougall, Dembroski & Krantz, 1981). Therefore , it is reasonable to conclude that autonomic reactivity (and several related neuroendocrine responses) has been reliably associated with Type-A behavior and, thereby, with CHD.

Recently, attempts to isolate the "toxic" component in the Type-A Behavior Pattern (TABP) have led researchers to a closer examination of such constructs as anger or hostility. An increasing number of published research studies has shown a reliable association between hostility, especially as measured by the Cook-Medley Ho scale, and atherosclerosis in CHD patients. For example, Williams and colleagues (Williams, Barefoot & Shekelle, 1985) reported that "potential for hostility" on Type-A assessment was related to angiographically documented coronary artery disease, while the overall scores for Type-A were not. Previously, Williams and his associates (Williams, Hanley, Lee, Kong, Blumenthal & Whalen, 1980) had found a significant relation between the Cook-Medley Hostility (Ho) subscale (Cook &

Medley, 1954) of the Minnesota Multiphasic Personality Inventory (MMPI) and severity of atherosclerosis in CHD patients. Re-examination of prospective data which had included the MMPI demonstrated that Cook-Medley Ho scores significantly predicted CHD incidence and mortality, independent of other risk factors (Barefoot, Dahlstrom & Williams, 1983; Shekelle, Gale, Ostfeld & Paul, 1983). The relationship between hostility and CHD is independent of Type-A, independent of traditional risk factors, and holds true for both men and women (Williams, 1984).

There is less evidence to establish the physiological pathway by which hostility affects the development of CHD. Yet, it again appears that cardiovascular reactivity is a feasible link. An early study by Harberg (1962) demonstrated that male subjects who reported greater hostility, in minor interpersonal conflicts, manifested greater diastolic blood pressure responses to the cold pressor task. A more recent study of college males found that systolic blood pressure and heart rate responses were significantly correlated with hostility, across three tasks of laboratory stress (Dembroski, MacDougall, et al. 1978). However, these researchers were unable to replicate the findings in women (MacDougall, Dembroski & Krantz, 1981). Thus, at least among males, the limited evidence finds hostility to be significantly associated with coronary

artery atherosclerosis, CHD mortality, and the pathogenic mechanism of cardiovascular reactivity.

Measurement Issues

The measurement of cardiovascular reactivity involves the assessment of changes in physiological parameters, usually blood pressure and heart rate, that occur when individuals are exposed to physical or psychological challenges. A variety of experimental tasks and procedures have been used in laboratory studies of reactivity. Krantz, Manuck, and Wing (1986) have reviewed a large number of studies and categorized psychological stressors and task variables relevant to reactivity. In many cases, the tasks can be administered to subjects in a replicable, standard manner. Most of these involve some form of challenge, including mental arithmetic (e.g., counting backwards by sevens), reaction time tasks, cognitive problem solving (e.g., Stroop Word-Color Test; I.Q. tasks); and a variety of vigilance tasks. Other standardized laboratory stressors involve passive participation or exposure to physical stimuli (e.g., viewing of pornographic films, cold pressor task). Another group of tasks tend to be more difficult to administer in a standardized manner. These would include the Structured Interview (SI) used to measure Type-A behavior, other kinds of stressful interviews, competitive games, public speaking situations, role-playing or stressful imagery tasks.

The use of standardized tasks in the assessment of reactivity offers the advantages of greater experimental precision and more confidence in replication, but may bring one's generalizations about the "real world" into question. Conversely, "realistic" stressors (such as interpersonal conflicts) may be more difficult to replicate, but tend to mirror real-life situations and often yield important information about the researcher's particular theoretical hypotheses. For the experiment proposed herein, the advantages of both approaches will be utilized, given the limits of practicality, by using two stressful tasks.

First, the cold pressor task was selected; probably the most standardized procedure used to assess cardiovascular reactivity. Immersion of the hand in ice water for 1 to 3 minutes generally defines the cold pressor. Exposure to the cold pressor has been reliably associated with increases in blood pressure and heart rate. Further, it is the only task that has been prospectively related to development of CHD (Keys, Taylor, et al., 1971).

A second task was designed to reflect the particular theoretical construct of this dissertation (MGRS); and to examine generalization across stressors. Specifically, a structured interview was developed which corresponds with the underlying factor components of Masculine Gender Role Stress. The Masculine Threat Interview (MTI) is based upon empirically-derived factors related to Masculine Gender Role

Stress (MGRS), and provides a behavioral counterpart to the self-reported assessment of MGRS. The MTI is a ten-question interview, designed specifically to challenge men with "real life" situations which are similar to those measured on the MGRS scale. The results of pilot data have substantiated the MTI's validity in eliciting cardiovascular reactivity, which can be inspected in Appendix I.

For purposes of the present research, then, both a Cold Pressor Task (CPT) and the Masculine Threat Interview (MTI) will be used to elicit cardiovascular reactivity. By using more than one stressor, a number of important questions can be addressed: Is cardiovascular reactivity a generalized response across stressors? Do men's self-perceptions of Masculine Gender Role Stress (measured on the MGRS scale) interact with the MTI more than the CPT? Is the reactivity observed in response to an "artificial" stimulus (the CPT) comparable to a more "naturalistic" stressor (the MTI)? Is reactivity equivalent for psychosocial, as well as physical, stressors? These, along with other pertinent questions of the present research study, are clarified in the following chapter.

CLARIFICATION OF THE PROBLEM

DESCRIPTION OF THE STUDY

The proposed study will examine the possibility that Masculine Gender Role Stress, as measured by the MGRS scale, may have a significant effect on cardiovascular reactivity. Consideration will also be given to possible inter-relations of MGRS with Type-A behavior and hostility, because of their known association with coronary heart disease. Briefly, the experimental procedures are as follows (these are described more fully in the appropriate METHOD section): Male subjects will complete questionnaires to assess MGRS, Type-A behavior and hostility. Then each subject participates individually in a laboratory experiment that involves: (1) a relaxation baseline, (2) exposure to first stressor task, (3) another relaxation baseline, (4) exposure to second stressor task. All subjects are exposed to both stressors, the Cold Pressor Task (CPT) and Masculine Threat Interview (MTI), in counter-balanced sequence to control for "order effects."

Dependent measures of cardiovascular physiology include systolic and diastolic blood pressure and heart rate. These are obtained on every subject in each of the four conditions of the experiment. Cardiovascular reactivity is determined by the difference between baseline and stressed levels. For example, if an individual's systolic blood pressure is 120 during baseline, and 135 during the stressful task, then his

systolic "reactivity" would be 15 mm Hg. Note there are six measures of cardiovascular reactivity per subject; Systolic blood pressure, diastolic blood pressure, and heart rate for both stressors (the CPT and MTI).

Masculine Gender Role Stress is the primary independent variable. For statistical analysis, subjects are divided into upper, middle, and lower thirds of the distribution of MGRS scores. Between-group differences will reflect whether levels of MGRS have significant effects on the measures of cardiovascular reactivity. Within-subjects differences from one stressor task to the other will allow comparisons of the Cold Pressor Task versus the Masculine Threat Interview.

If MGRS has a significant impact on reactivity, as hypothesized, that might help explain the greater CHD risk for males. Hence, further data analysis is used to measure associations between MGRS scores and the known psychological risk factors for CHD: Type-A behavior and hostility. These variables should, theoretically, be inter-related, as well as predictive of cardiovascular reactivity.

After the experiment, subjects completed a rating scale to measure which portions of the experiment they perceived as most stressful. These scores were used to assess whether subjective perceptions of stress would correspond with the differences expected between the relaxation baselines versus the stressor tasks in the experiment.

SPECIFIC RESEARCH HYPOTHESES

Hypothesis #1

First, it was hypothesized that men with higher self-reported levels of MGRS will respond to the stressor tasks with greater cardiovascular reactivity than subjects with lower MGRS scores. In other words, dependent measure(s) of cardiovascular physiology should show more reactivity among high-MGRS subjects than among low-MGRS subjects.

Hypothesis #2

Additionally, the study would determine whether the effect of MGRS on cardiovascular reactivity is constrained by specific stimulus characteristics of the stressors. In particular, could equivalent levels of psychophysiological arousal be expected on the Masculine Threat Interview (MTI) and the Cold Pressor Task (CPT)? The two stressors differ along several dimensions; the MTI is psychological, gender-related, and fairly naturalistic (in terms of its occurrence in daily life); the CPT is physical, gender-neutral, and somewhat artificial. This, then, is a question of "external validity" and generalization of effects.

Hypothesis #3

Scores on the MGRS scale, the Framingham Type-A Scale, and the Cook-Medley Hostility scale were hypothesized to be inter-related, and predictive of cardiovascular reactivity. That is, Masculine Gender Role Stress should be positively correlated with Type-A behavior and hostility; as a result,

these variables should overlap (share common variance) in the prediction of cardiovascular reactivity.

Hypothesis #4

Finally, scores on the Experiment Stress Rating Scale, which subjects completed after the experiment, should show at least minimal correspondence with the purported "stress" levels manipulated in the experiment. In other words, would subjects perceive (and, thus rate) the stressor tasks (CPT and MTI) as significantly more stressful than the baseline periods (of relaxed breathing)? Strictly speaking, this is more a methodological "validity check" than an hypothesis.

METHOD

RESEARCH DESIGN

A mixed two-factor design was used to experimentally determine the independent and interactional effects of MGRS and laboratory stressor tasks on cardiovascular reactivity. Reactivity differences between high, middle and low scorers on the MGRS scale are assessed as levels of a between-groups factor, and directly tests Hypothesis #1. A within-subjects factor tests differences of reactivity across two laboratory stressors, the CPT and the MTI, and addresses Hypothesis #2. This design also allows interactional comparisons, between levels of MGRS and stressor tasks, which could alter the interpretation of main effects. Thus, the mixed-factorial approach enables simultaneous examination of main effects for a between-groups factor and a within-subjects factor, while controlling for interaction effects on the dependent variable (Keppel, 1982).

A multiple regression design was also conducted to examine inter-relations between MGRS, Type-A behavior, and hostility as predictors of cardiovascular reactivity. The regression approach allows one to examine the collective and separate contributions among the independent variables that account for the variance of a dependent variable (Kerlinger & Pedhazur, 1973). Each aspect of Hypothesis #3 is thereby tested with the resultant simple and multiple correlations.

Comparisons of means on the Experiment Stress Rating Scale, showing subjects' perceptions of stress for baseline relaxation versus the Cold Pressor Task versus the Masculine Threat Interview, were used to address Hypothesis #4.

DEPENDENT MEASURES

The dependent variable, cardiovascular reactivity, was measured as "difference scores" between each individual's resting baseline and his physiological response to specific stressors. Three measures of cardiovascular physiology were used: Systolic blood pressure, diastolic blood pressure, and heart rate. These are defined more specifically below; also, a description is provided of the particular instrument used in this study for measurement.

Blood Pressure

Peak arterial pressure, occurring with the contraction of the heart muscle, is called systolic blood pressure (SBP). Arterial blood pressure during the relaxation phase of the cardiac cycle is referred to as diastolic blood pressure (DBP). Blood pressure readings are measured in terms of millimeters of mercury (mm Hg).

Heart Rate

The heart rate (HR) is determined by intermittent changes in blood pressure transmitted through the arteries by contracting and relaxing movements of the heart muscle.

Resulting blood pressure pulses provide an indirect assessment of the heartbeat, in beats-per-minute (bpm).

Instrumentation

Measurements of SBP, DBP, and HR in the laboratory will be taken with the Norelco Electronic Digital Blood Pressure Meter (Model HC3500). Blood pressure accuracy for this device has been documented within 3 mm Hg, and heart rate accuracy is within 5% (Healthcare, 1983). Validity checks by this investigator on two separate Norelco meters (same model) indicate that pressure can be calibrated within 2 mm Hg, and that systolic readings are indeed within 3 mm Hg of those auscultated. Another researcher (Southard, 1985) performed simultaneous validity checks against a standard Baum mercury sphygmomanometer, on college age subjects, and obtained a very high level of cross validation ($r = .99$, $p < .01$, for SBP; and $r = .88$, $p < .05$ for DBP). Simultaneous comparisons of heart rate (i.e., blood pressure pulse) on the Baum mercury sphygmomanometer and the Norelco HC3500, in clinical use by the present investigator, have repeatedly demonstrated identical readings.

INDEPENDENT VARIABLES

Laboratory Stressors

Cold Pressor Task: Immersion of the hand (or foot) in ice water (1 - 3 degrees Centigrade) generally defines the cold pressor task. It was first introduced to the medical community, in the 1930's, as a screening procedure for the detection of vascular hyperreactivity (Hines & Brown, 1936; Hines, 1937, 1940). Physiological reactions to the Cold Pressor Task (CPT) are probably influenced by one's previous experience, perception of pain, level of challenge, etc. Nevertheless, a general pattern of hemodynamic response has been found (Boyer, Fraser & Doyle, 1960; Feldt & Wenstrand, 1942). In healthy normotensive subjects, the CPT results in systolic and/or diastolic blood pressure increases of approximately 15 mm Hg, and heart rate acceleration of about 10 beats per minute. Duration of exposure to the CPT varies throughout the medical literature, from less than a minute to more than five minutes. Exposure of at least one minute seems to be preferred, and is the duration used by Keys et al. (1971), in their prospective study relating cold pressor responses to the development of coronary heart disease.

Masculine Threat Interview: This task was developed for the present study, as a behavioral elicitor of gender-related stress for males. The Masculine Threat Interview (MTI) is based on empirically-derived factors associated with Masculine Gender Role Stress (MGRS); specifically,

these include self-perceptions of (1) physical inadequacy, (2) emotional inexpressiveness, (3) subordination to women, (4) intellectual inferiority, and (5) performance failure in work or sex. The MTI is designed to challenge men, in these five domains, via a ten-question interview conducted by a female research assistant in a curt, demanding manner (refer to Appendix D).

MGRS Scale

Development of the Masculine Gender Role Stress (MGRS) scale has been thoroughly described in a previous section. To summarize, MGRS items represent situations (cognitive or behavioral or environmental) which tend to elicit gender-role related stress in men (see Appendix E). This 40-item scale is structured for subjects to rate each item as if they were in the situation. Items are rated on a Likert-type, unipolar scale that ranges from "0" (not stressful) to "5" (extremely stressful). Total scores potentially range from 0 to 200 but, more likely, will fall between 60 and 125 for college males (see Appendix I). In pilot testing with male college students, the MGRS demonstrated a high degree of internal consistency with alpha coefficients in the low .90's. In the same population, test-retest reliability was a very respectable 0.93 across a two-week period.

Framingham Type A Scale

The Framingham Type-A Scale is a 10-item self-report measure that assesses competitive drive, time urgency, and

perceptions of job pressure (see Appendix F). Scoring is simply the summing of all responses in the Type-A direction, ranging from 0 to 10 (scores are typically transformed into decimals from 0 to 1). In most research on Type-A behavior, using the Framingham scale or other measures, subjects are usually classified as "A" or "B" by a median split; often, those categorized as Type-A tend to be in the .5 to .8 range (Haynes, Feinleib & Kannel, 1980). The name of this scale is commonly abridged, FTAS.

Cook-Medley Hostility Scale

The Cook and Medley (1954) "Ho" scale is composed of 50 true/false items (see Appendix G) which were selected from the Minnesota Multiphasic Personality Inventory (MMPI). Items were originally chosen on the basis of content and statistical discrimination of teachers with good-versus-bad rapport with students. Cook and Medley (1954) suggested that high scores reflect individuals who are characterized by chronic anger, and who tend to view others as dishonest, untrustworthy, and immoral. Convergent and discriminant validity has been demonstrated by Smith and Frohm (1985), who refer to high "Ho" scorers as suspicious, resentful, and prone to anger. Like the other measures discussed, each item is weighted equally and scoring is accomplished by the summing of items (items 16, 20, and 33 are reverse-scored). Throughout the remainder of this paper, this measure will be referred to by the abbreviation, CMHO.

SUBJECTS

The Introductory Psychology Volunteer Subjects Pool in the Psychology Department, at Virginia Polytechnic Institute and State University (Virginia Tech), provided participants for this study. The experimental procedures conformed with "Guidelines and Procedures for Research with Human Subjects" and all participants signed a form indicating their informed consent (see Appendix A).

Fifty male subjects from this college-age population were recruited. Of these, two subjects were disqualified; one failed to complete the questionnaires and another was dismissed because of a "paradoxical" anxiety response to the relaxation procedures. Thus, the dissertation experiment is based on completed data from 48 subjects.

These 48 male participants were predominantly caucasian (94%) and single (98%), with a mean age of 19 years (ranging from 18 to 24). Average relaxation baseline readings for systolic and diastolic blood pressures (117/69 mm Hg), and heart rate (69 bpm), indicate that subjects were probably typical of normotensive college-age males.[2]

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2. Relaxation baseline readings, as reported here, are probably somewhat lower than "resting" measures which might be obtained by health care professionals. Typically, blood pressure and heart rate measurements are taken while the subject is seating and resting, but do not include specific relaxation procedures (as used in this study).

All subjects refrained from the use of alcohol and caffeine on the day of the experiment, and 92% refrained from cigarette smoking on that day. Subject characteristics are summarized in Table 2. Questionnaire and laboratory measures were taken during one-hour periods between 1:00 and 6:00 PM, and all data was gathered from January through March of 1987.

For the experimental manipulations of the dissertation, all 48 subjects were divided into three equal groups based on their MGRS scores. Upper, middle, and lower thirds of the MGRS distribution were used to place subjects in groups respectively defined as either high-MGRS, middle-MGRS, or low-MGRS scorers. Prior to hypothesis testing, statistical tests (MANOVA) were used to demonstrate that no significant differences existed between these groups on the baseline measures of systolic blood pressure, diastolic pressure, and heart rate. A summary of the relevant group means is presented in Table 3, showing only small variations in SBP, DBP, and HR from group-to-group. Also shown are the means of MGRS scores for each group.

Table 2: Subject Characteristics

Number	48
Average Age	19
Percent Caucasian	94
Average Baseline Systolic Blood Pressure[1]	117
Average Baseline Diastolic Blood Pressure[1]	69
Average Baseline Heart Rate[1]	69
Percent Using Cigarettes[2]	8
Percent Using Alcohol[2]	0
Percent Using Caffeine[2]	0

1. During relaxation procedures
2. On the day of the experiment

Table 3: Baseline Measures of MGRS Groups

Group*	MGRS Mean	SBP		DBP		HR	
		CPT	MTI	CPT	MTI	CPT	MTI
High MGRS	113	118	117	67	67	67	68
Middle MGRS	89	117	116	71	70	70	68
Low MGRS	66	119	118	71	71	71	71

* Each group n = 16.

Note: Rounded to whole numbers, for clarity.

PROCEDURES

Subjects participated individually in the experiment which lasted about one hour. Sequentially, the procedures included the completion of MGRS, FTAS, and CMHO scales; a brief introduction and equipment demonstration; then the four phases of controlled experimentation: (1) a relaxation baseline, (2) first stressor task, (3) a second relaxation baseline, (4) second stressor task. Afterward subjects were given the Experiment Stress Rating Scale, then debriefed.

The completion of questionnaires took 15 - 20 minutes, and explaining and demonstrating the procedures took another 10 minutes. Each of the relaxation phases lasted about 5 minutes. These baseline procedures (phases 1 and 3) verbally guided subjects through the "relaxation response" (Benson, 1975), and used breathing exercises from "respiratory relief therapy" (Longo & Vom Saal, 1984). The Cold Pressor Task lasted about 2 minutes and Masculine Threat Interviews took about 3 minutes for each subject. These stressors (phases 2 and 4) were administered to subjects in counter-balanced order, to equalize any cumulative effects. The debriefing period usually lasted about 10 minutes.

Blood pressure and heart rate readings were taken during the introductory phase to habituate subjects to the measurement procedures, and during the debriefing phase to ensure that subjects left without hemodynamic abnormalities.

Blood pressure and heart rate readings were obtained twice during each relaxation and stress phase, and the average of these readings (rounded to whole numbers) was used to compute cardiovascular reactivity (CVR). CVR was operationalized as "difference scores" between baseline and stressor means for SBP, DBP, and HR. Thus, three measures of reactivity were associated with the Cold Pressor Task, and three measures of reactivity corresponded with the Masculine Threat Interview.

STATISTICAL ANALYSES

A mixed two-factor design (explained earlier) allows for testing Hypothesis #1, that MGRS alters CVR, and also Hypothesis #2, that such effects can be generalized across two very different stressor tasks. Appropriate statistics would involve fixed-components Analysis of Variance (ANOVA, see Winer, 1971), with error-variances computed separately for the between-subjects factor and within-subjects factor (see Keppel, 1982). In this case, a between-subjects factor is used to compare high, middle and low scores on the MGRS scale, while the within-subjects factor is used to examine the difference between stressors: the Cold Pressor Task and Masculine Threat Interview. However, because of multiple and related dependent variables (i.e., three measures of cardiovascular reactivity), the above design requires the utilization of Multivariate Analysis of Variance (MANOVA;

see Keppel, 1982). MANOVA procedures examine the effect of independent factors on all dependent measures simultaneously (Winer, 1971), and is particularly appropriate for designs that have repeated-measures (within-subjects) factors, where variance-covariance assumptions are violated (Keppel, 1982). When the multivariate analysis is significant, it is then appropriate to examine univariate statistics (e.g., ANOVA), and perform comparisons (e.g., Newman-Keuls or Duncan tests) to isolate the effects.

Hypothesis #3 suggests that MGRS is related to major psychological risk (i.e., Type-A behavior and hostility) for coronary heart disease (CHD), and that these should overlap in predicting cardiovascular reactivity. Use of multiple regression analysis is well-suited to examine such inter-relations between independent variables, and their separate and collective effects on a dependent measure (Kerlinger & Pedhazur, 1973). For this analysis, independent predictors were scores on the MGRS, FTAS and CMHO scales; the dependent measure was cardiovascular reactivity (SBP, across both stressors).

Responses on the Experiment Stress Rating Scale provide a check on whether or not subjects' perceptions of stress correspond with experimental manipulations of stressful and non-stressful conditions, as stated in Hypothesis #4. Simple t-ratios between mean scores are used for comparison of the subjective ratings of relaxation versus stressor periods.

CONTRIBUTIONS FROM PILOT STUDIES

Prior to the dissertation experiment, pilot data was gathered from 93 subjects, in smaller subsamples, to examine several ancillary questions. These data replicated previous findings regarding MGRS as gender-specific to men, suggested the relationship of MGRS to Type-A behavior and hostility, and demonstrated the reliability of MGRS scores across time ($r = .93$). Pilot data demonstrated that "habituation" to the laboratory environment and procedures does occur within 5 to 10 minutes, based on SBP responses. Pilot data found the Masculine Threat Interview to be far more stressful, in terms of physiologic responses, than a "neutral" interview; supporting its inclusion in this study. Additionally, the Cold Pressor Task was shown to produce expected physiologic responses. Finally, trends in the pilot data suggested that MGRS may, indeed, be related to cardiovascular reactivity in response to both stressors. These findings are presented in Appendix I, more thoroughly.

SUMMARY OF DISSERTATION DATA

An overall summary of the data gathered for analyses used in this dissertation is provided in Table 4, including a key to the abbreviations used in the following RESULTS and DISCUSSION chapters. Individual data from all subjects is presented in Appendix J.

Table 4: Overall Data Summary

	Questionnaires			Reactivity to the CPT			Reactivity to the MTI		
	MGRS	FTAS	CMHO	SBP	DBP	HR	SBP	DBP	HR
Mean*	89	5	21	17	14	2	17	5	1
Std. Dev.	21	2	5	10	10	7	7	6	6

Note: All numbers rounded to whole numerals

Note: An abbreviation key is provided below

CPT	Cold Pressor Task
MTI	Masculine Threat Interview
MGRS	Masculine Gender Role Stress scale
FTAS	Framingham Type A Scale
CMHO	Cook Medley Hostility scale
SBP	Systolic Blood Pressure
DBP	Diastolic Blood Pressure
HR	Heart Rate

* n = 48

RESULTS

Computerized statistical programs (SPSS Inc., 1983) were used to perform all analyses for the dissertation. A mixed-factorial MANOVA, one-way ANOVA's, as well as Duncan's multiple range comparisons were used to test Hypothesis #1, that MGRS affects cardiovascular reactivity, and Hypothesis #2, that such effects generalize across two very different stressor tasks used to elicit the reactivity. The presence of an interaction between MGRS and the type of stressor, Cold Pressor Task or Masculine Threat Interview, was also assessed.

Multiple regression analysis and Pearson correlation coefficients were used to examine Hypothesis #3, that MGRS is related to the known psychological risk factors (Type-A and hostility) for coronary heart disease (CHD), and that these overlap (share variance) in predicting cardiovascular reactivity.

Paired t-tests were used to test Hypothesis #4, that subjects' perceptions of stress during the experiment would be significantly higher for stressor task phases than for the relaxation baselines.

FINDINGS RELEVANT TO HYPOTHESIS #1

MGRS and Cardiovascular Reactivity

Based on MGRS scores, subjects were divided into three equal groups (n = 16) representing the lower, middle, and

upper thirds of the distribution. Thus, the main question is whether or not the low, middle, and high groups differ on dependent measures of cardiovascular reactivity. Table 5 provides a breakdown of the experimental cells utilized in this analysis (p. 52).

The results of the 3 x 2 (groups-by-stressors) MANOVA indicate a statistically significant between-groups effect. Wilks' multivariate $F(6, 84) = 2.46$, with $p = .030$. The related univariate statistics reveal that a between-groups effect is only significant for systolic reactivity, where the $F(2, 45) = 7.62$, with $p = .001$. Differences between MGRS groups were not significant for reactivity associated with diastolic pressures, $F(2, 45) = 1.08$, with $p = .347$, or heart rate, $F(2, 45) = .45$, with $p = .641$. The overall group effects of MANOVA are summarized in Table 6 (p. 53).

MANOVA does not test the between-groups differences separately for the Cold Pressor Task (CPT) and the Masculine Threat Interview (MTI). Therefore, two separate one-way ANOVA's were computed to examine the MGRS group differences for systolic reactivity on different stressors. Duncan's post hoc comparison tests were used to further isolate the between-group effects.

ANOVA statistics for between-groups differences on reactivity to the CPT were marginally short of significance, $F(2, 45) = 2.80$, with $p = 071$. However, Duncan's test identified the significant difference ($p < .05$) between low

and high MGRS groups. ANOVA statistics for between-group differences on reactivity to the MTI were found significant, $F(2, 45) = 9.85$, with $p < .001$. Duncan's test identified the low MGRS group as significantly different ($p < .05$) from the middle and high MGRS groups. These findings regarding groups effects on systolic reactivity are shown in Table 7. Also presented are tests for trend, which demonstrate that the relationship between MGRS and systolic reactivity is linear in form; $F = 4.93$, $p = .032$, in the CPT condition; and $F = 17.71$, $p < .001$, in the MTI condition. Tests for quadratic trend were not significant.

To summarize, MGRS does have a significant effect on cardiovascular reactivity. However, this relationship only holds for systolic blood pressure, and not DBP, nor HR. In response to the Cold Pressor Task, the high-MGRS group was significantly more SBP reactive than the low-MGRS group. For the Masculine Threat Interview, high- and middle-MGRS groups were significantly more SBP reactive than the low-MGRS group. The group-by-group comparisons are potentially less important than the trend analyses, which show a linear relation between MGRS and systolic reactivity (for both stressors). That is, progressively higher levels of MGRS are associated with corresponding increases in systolic reactivity. Figure 1 (on page 55) provides an illustration of this relationship. These results support Hypothesis #1.

Table 5: Experimental Cell Means

Dependent Variable	Independent Variable	Mean	Std Dev
SBP Response to CPT	Low MGRS Scores	12.19	7.49
	Middle MGRS Scores	18.25	11.61
	High MGRS Scores	19.56	8.61
	Total Cell	16.67	9.75
SBP Response to MTI	Low MGRS Scores	11.44	5.43
	Middle MGRS Scores	18.25	4.31
	High MGRS Scores	20.06	7.26
	Total Cell	16.58	6.80
DBP Response to CPT	Low MGRS Scores	10.94	8.68
	Middle MGRS Scores	12.88	10.79
	High MGRS Scores	16.69	9.79
	Total Cell	13.50	9.88
DBP Response to MTI	Low MGRS Scores	4.19	6.75
	Middle MGRS Scores	4.88	6.01
	High MGRS Scores	5.63	6.26
	Total Cell	4.90	6.24
HR Response to CPT	Low MGRS Scores	.13	7.68
	Middle MGRS Scores	1.94	6.95
	High MGRS Scores	2.56	7.20
	Total Cell	1.54	7.20
HR Response to MTI	Low MGRS Scores	.38	7.43
	Middle MGRS Scores	1.50	6.47
	High MGRS Scores	1.00	5.56
	Total Cell	.96	6.41

Note: MGRS levels are based on 3 equal groups; each n = 16.

Table 6: MANOVA Statistics for GROUP Effects

Multivariate F-tests (with d.f. = 6, 84)

Test Name	Test Value	F Ratio	Sig
Pillais	.28	2.34	.038
Hotellings	.37	2.58	.024
Wilks	.73	2.46	.030

Univariate F-tests (with d.f. = 2, 45)

Variable	Sum Sqrs	Mean Sqrs	F Ratio	Sig
SBP Reactivity	1150.75	575.38	7.62	.001
Error (SBP)	3399.75	75.55		
DBP Reactivity	211.65	105.82	1.08	.347
Error (DBP)	4399.09	97.76		
HR Reactivity	48.06	24.03	.45	.641
Error (HR)	2410.94	53.58		

Table 7: ANOVA Statistics for GROUP Effects

SBP Reactivity to the Cold Pressor Task

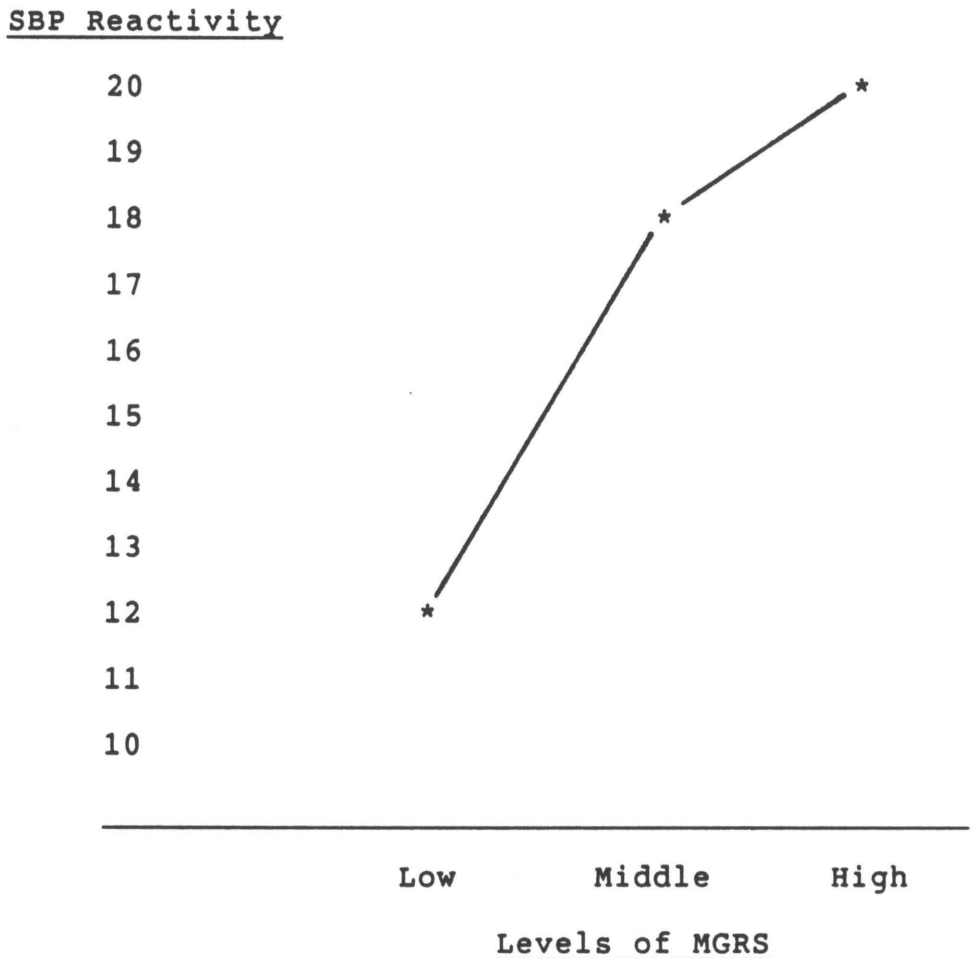
Source	Sum Sqrs	d.f.	Mean Sqrs	F Ratio	Sig
Between	495.29	2	247.65	2.80	.071
Linear	435.12	1	435.12	4.93	.032
Quad.	60.17	1	60.17	0.68	.414
Within	3975.38	45	88.34		
Total	4470.67	47			

Duncan Test ($p < .05$): Low MGRS vs. High MGRS

SBP Reactivity to the Masculine Threat Interview

Source	Sum Sqrs	d.f.	Mean Sqrs	F Ratio	Sig
Between	661.79	2	330.90	9.85	.000
Linear	595.12	1	595.12	17.71	.000
Quad.	66.67	1	66.67	1.98	.166
Within	1511.88	45	33.60		
Total	2173.67	47			

Duncan Test ($p < .05$): Low MGRS vs. Middle & High MGRS



* Indicates baseline-to-stressor SBP increases (in mm Hg) averaged across both stressor tasks (note: the group means were practically the same for both stressors).

Figure 1: MGRS Levels and Systolic Reactivity

FINDINGS RELEVANT TO HYPOTHESIS #2

Interaction Between MGRS and Stressors

Results of the 3 x 2 (groups-by-stressors) MANOVA fail to demonstrate a significant interaction. The multivariate Wilks' $F(6, 84) = .78$, with $p = .590$, falls far short of statistical significance. Univariate statistics are also non-significant and, without a significant multivariate F, should not be considered anyway. These findings show that MGRS scores do not interact differently with a Cold Pressor Task versus Masculine Threat Interview (see Table 8, p. 58). Therefore, between-groups effects (reported above), as well as within-subjects effects (reported below), are interpreted independent of each other.

Stressor Differences in Reactivity

There was a significant effect of the repeated-measures factor, stressor tasks, in the 3 x 2 (groups-by-stressors) MANOVA, shown by Wilks' multivariate $F(3, 43) = 22.28$, with $p < .001$). Examination of the related univariate statistics indicate that the stressors, CPT and MTI, are significantly different only for diastolic reactivity, $F(1, 45) = 46.40$, with $p < .001$). Reactivity to the CPT versus the MTI is not significantly different for systolic pressure, $F(1, 45) = .00$, with $p = .952$, nor heart rate, $F(1, 45) = .19$, with $p = .662$). Table 9 presents these findings (p. 59).

The above results are not surprising when one looks at the mean reactivity figures for each category (see Table 4).

Systolic reactivity is about 17 mm Hg, for both the CPT and the MTI. Heart rate increases were approximately 2 bpm for the CPT, and 1 bpm for the MTI. By contrast, diastolic reactivity is about 14 mm Hg for the CPT and only 5 mm Hg for the MTI, an average difference of 9 mm Hg.

To summarize, reactivity associated with DBP is notably greater in response to the Cold Pressor Task (CPT) than to the Masculine Threat Interview (MTI). SBP and HR responses did not differ across stressors. Since MGRS is only related to SBP responses, the results would support Hypothesis #2; specifically, that the effect of MGRS on reactivity seems to generalize across the different stressor tasks. Further, such findings indicate that SBP responses can be "collapsed" across stressors (CPT and MTI), and subsumed as "systolic reactivity to stress."

Table 8: MANOVA Statistics for Interaction Effects

Multivariate F-tests (with d.f. = 6, 84)

Test Name	Test Value	F Ratio	Sig
Pillais	.10	.77	.592
Hotellings	.11	.78	.588
Wilks	.90	.78	.590

Univariate F-tests (with d.f. = 2, 45)

Variable	Sum Sqrs	Mean Sqrs	F Ratio	Sig
SBP Reactivity	6.33	3.17	.07	.934
Error (SBP)	2087.50	46.39		
DBP Reactivity	78.77	39.39	1.03	.367
Error (DBP)	1726.97	38.38		
HR Reactivity	13.40	6.70	.16	.853
Error (HR)	1895.44	42.12		

Table 9: MANOVA Statistics for STRESSOR Effects

Multivariate F-tests (with d.f. = 3, 43)

Test Name	Test Value	F Ratio	Sig
Pillais	.61	22.28	.000
Hotellings	1.55	22.28	.000
Wilks	.39	22.28	.000

Univariate F-tests (with d.f. = 1, 45)

Variable	Sum Sqrs	Mean Sqrs	F Ratio	Sig
SBP Reactivity	.17	.17	.00	.952
Error (SBP)	2087.50	46.39		
DBP Reactivity	1776.76	1776.76	46.40	.000
Error (DBP)	1726.97	38.38		
HR Reactivity	8.17	8.17	.19	.662
Error (HR)	1895.44	42.12		

FINDINGS RELEVANT TO HYPOTHESIS #3

Correlations Among Predictor Variables

MGRS is correlated with FTAS ($r = .58$, $p < .01$), and with CMHO ($r = .39$, $p < .01$). The relationship between FTAS and CMHO is also significant ($r = .38$, $p < .01$). Table 10 shows these relationships.

Predicting Systolic Reactivity to Stress

Findings in the previous sections show MGRS related to systolic reactivity, with no differences emerging between the stressors on SBP. Therefore, a regression equation was computed for systolic reactivity collapsed (averaged) across both the Cold Pressor Task and Masculine Threat Interview. There were two sets of criteria by which the independent variables are selected: (1) "stepwise" criteria for best prediction, and (2) all predictors "forced" into regression for evaluation of independent and overlapping effects.

Using "stepwise" criteria, a statistically significant regression equation was computed with one predictor, MGRS scores. Multiple correlation ($R = .41$) is significant with $F = 9.45$, $p = .004$. An R^2 of .17 indicates that 17% of the variance of systolic reactivity can be explained using this equation. Since MGRS is the only predictor in the equation, the multiple correlation would be equivalent to a Pearson correlation coefficient (i.e., $r = .41$).

For sake of comparison, additional regression equations were calculated by entering each remaining predictor, FTAS

and CMHO, into separate analyses. Thus, examining Table 11, direct comparisons can be made between MGRS, FTAS, and CMHO as predictors of systolic blood pressure reactivity. While each predictor independently explains a significant portion of variance ($p < .05$), the magnitude of prediction descends from MGRS ($R = .41$) to FTAS ($R = .34$) to CMHO ($R = .29$).

When all three predictors are "forced" together into one regression, the resulting equation is statistically significant ($p < .05$). However, adding Type-A (FTAS) and hostility (CMHO) scores to MGRS fails to add much power. The combined predictive power of MGRS, FTAS, and CMHO explains 20% of the variance (i.e., R^2), only a 3% increase over using the MGRS scores alone. That increase is not statistically significant.

To summarize, MGRS is significantly inter-related with Type-A behavior and hostility. In other words, MGRS does correlate with the psychological risk factors associated with coronary heart disease. As suggested in Hypothesis #3, MGRS, Type-A behavior (FTAS), and hostility (CMHO) are each significant predictors of cardiovascular reactivity (in this case, SBP responses), and clearly overlap in their effects. These results are particularly valuable in demonstrating that MGRS is an even better predictor of SBP reactivity than either Type-A behavior or hostility.

Table 10: Correlation Between MGRS, FTAS, and CMHO

Relations Among Predictor Variables

	MGRS	FTAS	CMHO
MGRS	1.00	.58**	.39**
FTAS	.58**	1.00	.38**
CMHO	.39**	.38**	1.00

** P < .01

Table 11: Multiple Regression Statistics

Systolic Blood Pressure Reactivity to Stress

Predictor	Mult R	R Sqr	Beta	F Ratio	Sig
MGRS[1]	.41	.17	.41	9.45	.004
FTAS[2]	.34	.12	.34	6.08	.017
CMHO[2]	.29	.08	.29	4.11	.049
MGRS[3]	.45	.20	.29	3.64	.020
FTAS[3]			.12		
CMHO[3]			.13		

1. Selected by stepwise criteria for regression
2. Entered into separate regression equations
3. Forced together in one regression equation

FINDINGS RELEVANT TO HYPOTHESIS #4

Subjective Perceptions of Stress

At the end of the experiment, just prior to debriefing, subjects rated (on a Likert-type scale ranging from 0 - 5) the amount of "stress" experienced during each experimental phase. Thus, self-perceptions of stress are available with regard to (1) the relaxation baseline periods, (2) the Cold Pressor Task, and (3) the Masculine Threat Interview. Average values indicate that relaxation phases were indeed non-stressful (Mean = .50), and that the stressor tasks were each moderately stressful (CPT, Mean = 2.96; and MTI, Mean = 2.77) and fairly equivalent.

Results of the paired t-tests indicate that subjects perceive no significant difference (in the stressfulness) between the CPT and the MTI ($t = .93$, $p = .36$); but both tasks are significantly more stressful than the relaxation exercises used for the baseline periods ($t = 12.75$, $p < .01$, for CPT stressor; and $t = 13.76$, $p < .01$, for MTI stressor). These findings support Hypothesis #4; providing a validity check on the experimental manipulations used in this study.

DISCUSSION

Previous research on the construct and measurement of Masculine Gender Role Stress (MGRS; Eisler & Skidmore, 1987) validates the assumption of sex differences in the appraisal of stressful situations. In particular, situations found more stressful for men than women were those that reflected physical inadequacy, emotional inexpressiveness of "tender" feelings, subordination to women, intellectual inferiority, and performance failures in work or sex. Additionally, MGRS scores were related to other indices of stress, specifically anger and anxiety. And, while MGRS scores vary considerably in different men, the scores are quite reliable within each individual on test-retest comparisons. These findings added validity to the construct, Masculine Gender Role Stress, and established the utility of a scale to measure MGRS.

The present study significantly extends the usefulness of the MGRS concept. As discussed below, MGRS scores are clearly related to systolic blood pressure reactivity in men and, further, MGRS scores correlate with known psychological risk factors (Type-A behavior, hostility) for coronary heart disease (CHD).

MGRS and Cardiovascular Reactivity

The primary hypothesis was supported by the finding that MGRS scores are significantly related to cardiovascular

reactivity. Specifically, subjects were divided into equal groups representing low, middle, and high scores on MGRS; and results of the 3 x 2 (groups-by-stressors) MANOVA show a significant between-groups effect on the dependent measures of reactivity. However, the related univariate statistics reveal this effect is significant only for systolic blood pressure reactivity, and not significant for the reactivity associated with diastolic blood pressure or heart rate.

Separate ANOVA and Duncan post hoc comparisons indicate that significant group differences are between low versus high MGRS groups in response to the Cold Pressor Task, and between low versus middle and high MGRS groups in response to the Masculine Threat Interview. Yet, for both stressors, tests for trend demonstrate a linear relationship between MGRS scores and systolic reactivity. That is, an increase in the level of MGRS leads to a proportionate increase in systolic reactivity.

Generalization of Effects Across Stressors

Hypothesis #2 was concerned with testing whether the effects of MGRS on cardiovascular reactivity would carry across different stressor tasks. Systolic blood pressure reactivity was the only measure of cardiovascular physiology related to MGRS, and both the Cold Pressor Task (CPT) and Masculine Threat Interview (MTI) elicited considerable SBP increases. The two stressors differ in terms of explicit

gender-relatedness of the situation, and also according to stumilus properties as mainly physical versus psychosocial. The CPT is a painful physical stimulus, with no inherent gender-role component; whereas the MTI is an uncomfortable psyhosocial situation, with clear masculine-role threats. However, both tasks produced essentially the same magnitude of SBP reactivity (CPT mean = 16.67; MTI mean = 16.58). Apparently, the effects of MGRS on cardiovascular reactivity generalize broadly across these environmental dimensions of the stress-eliciting stimuli. This finding would support the generalization of MGRS effects beyond the laboratory: Specifically, individuals are far more likely to encounter challenging interpersonal situations (e.g., the MTI) in the natural environment than a specific painful stressor (e.g., the CPT). Thus, it is very probable that men who experience high levels of MGRS, in daily living, are prone to (harmful) concommittent increases in systolic blood pressure.

MGRS, Type-A Behavior, Hostility and Reactivity

Multiple regression analyses indicate MGRS is related to Type-A behavior and hostility, and that these overlap in predicting cardiovascular reactivity. Thus, in support of Hypothesis #3, MGRS is associated with major psychosocial risk factors for CHD, and each of these operate through the pathophysiological mechanism of cardiovascular reactivity.

Regression equations were computed with SBP reactivity collapsed across stressors as the dependent measure. Using stepwise criteria, MGRS was the best predictor of systolic reactivity. Computed separately, both Type-A behavior and hostility were also significant predictors of reactivity. The amount of variance explained with each equation varied from 17% to 12% to 8% for MGRS, Type-A behavior (the FTAS), and hostility (CMHO), respectively.

With all predictors "forced" together into regression, the resulting equation remains statistically significant but fails to add much predictive power. Thus, a combination of MGRS, Type-A behavior, and hostility scores explain 20% of the variance of systolic reactivity; whereas the MGRS scores alone account for 17% of the variance.

Together, these findings indicate that MGRS scores are a better predictor of systolic reactivity than FTAS or CMHO scores, even though the latter are significantly associated with reactivity. The robustness of MGRS in relation to SBP reactivity seems to support the theoretical assumptions stated earlier in this dissertation. In particular, this data is evidence for the assumption that Masculine Gender Role Stess could have negative consequences on the somatic (physiological) functioning of men. Further, the results demonstrate that MGRS, FTAS and CMHO are inter-related and overlapping (non-additive) in the prediction of reactivity. This offers support, although not proof, that some aspects

of masculine gender role socialization may act as a common denominator in the development of psychological/behavioral characteristics which place men at greater risk for CHD.

Multiple Measures of Cardiovascular Reactivity

In this study, measures of cardiovascular reactivity included systolic and diastolic blood pressures (SBP; DBP), and heart rate (HR). However, only the SBP response was significantly related to different levels of MGRS in the experiment. The prominence of systolic reactivity is common in other studies that attempt to demonstrate cardiovascular responses in relation to a psychosocial variable; notably in the Type-A literature (e.g., Dembroski, MacDougall, Shields, Petitto & Lushene, 1978; Manuck & Garland, 1979). This raises an important question: Would researchers be more accurate in using the term "systolic reactivity" instead of the broader construct of "cardiovascular reactivity"?

It might be helpful if researchers used only those terms that describe the specific results of their findings. On the other hand, most of the reactivity studies (including the present one) test several measures of cardiovascular response before isolating the significant one. But, even more to the point, there are numerous exceptions to the rule of greater replicability for the SBP response. That is, the reactivity differences between Type-A's and B's are often significant for DBP, HR, and other cardiovascular markers as

well as, or instead of, SBP (cf., Houston, Smith & Zurawski, 1986). Given the infancy of research on psychosocial variables and reactivity, one could argue that several cardiovascular measures are needed, in each experiment, to identify potential patterns of physiological response to various tasks/stressors.

The results of this study do suggest some interesting patterns of cardiovascular responses to stress. For example SBP reactivity was related to MGRS, a psychosocial variable; whereas the DBP was more reactive to the Cold Pressor Task, a painful physical stimulus. On one level, MGRS reflects mental strain while the cold pressor represents a sensory task, but the pharmacology of these differences is unclear (cf., McKinney, Hofschire, Buell & Eliot, 1984). On another level, the pressor effect of DBP on SBP might be considered. For example, in this study SBP reactivity was pronounced, and fairly equivalent for both stressors; however, DBP was minimal in response to the MTI but signifiant in response to the CPT. Thus, some uncertainty remains with regard to DBP effects on the SBP in response to the different stressors.

Furthermore, the results also show that DBP responses to specific painful stressors (cold) are probably autonomic, regardless of the psychosocial variables. Specifically, the average subject's DBP went up almost 14 mm Hg in response to the Cold Pressor Task (CPT) but less than 5 mm Hg during the Masculine Threat Interview (MTI). This 9 mm Hg difference

between stressor situations was statistically significant, and unrelated to MGRS. It may be that DBP is more directly reactive to acute thermal changes than other cardiovascular measures. It is also interesting to note that the only prospective study linking cardiovascular reactivity to the development of CHD 23 years later (Keys, et al., 1971) was based on DBP responses to the cold pressor. Perhaps some portion of individual differences in physiologic reactivity, as reflected in DBP responses, may be a function of genetic influences as proposed by Ross and Chesney (1986), and are therefore less affected by psychosocial phenomena.

Conclusions and Implications

The major finding of this study is the significant relationship between Masculine Gender Role Stress (MGRS) and systolic blood pressure (SBP) reactivity-to-stress. As a measure of cardiovascular reactivity, SBP responses varied as a function of low, middle, and high MGRS scores. Higher levels of MGRS were associated with greater SBP reactivity, across both stressor conditions. Average systolic responses to the CPT and MTI were practically the same, approximately 17 mm Hg. And, for both stressor situations, subjects with high MGRS scores had significantly greater SBP reactivity (about 20 mm Hg) than subjects with low MGRS scores (about 12 mm Hg). As discussed earlier, this relationship between SBP reactivity and psychosocial variables is not an uncommon

finding. In addition, other researchers have found the psychosocial/SBP relationship to hold across situations. For example, Manuck and Garland (1979) demonstrated systolic reactivity differences between Type-A and Type-B college men across mental tasks involving high-versus-low incentives. Such findings, along with results of the present study, seem to suggest that stable, cognitive characteristics (traits?) may predispose individuals as hyper-responsive to stressful situations in general. While it may be premature to claim a cause-effect relationship, the results clearly demonstrate that higher levels of MGRS are significantly associated with increased systolic blood pressure reactivity.

Another important finding is the relationship of MGRS to Type-A behavior and hostility. These variables are not only inter-related but, also, overlap in the prediction of systolic reactivity. As discussed above, this adds support to the theoretical assumption that gender role socialization may account for the higher prevalence among men of Type-A behavior, and coronary heart disease (CHD). Further support is offered by finding MGRS a stronger predictor of systolic reactivity than Type-A behavior or hostility. The clinical implications should be apparent when one considers jointly the evidence linking Type-A, hostility, and cardiovascular reactivity to CHD. That is, assessment of MGRS may provide some utility in prediction and prevention of CHD among men.

It should be remembered that numerous published studies have examined the relationship between Type-A behavior and physiologic reactivity, and there remains a great deal of ambiguity about any "typical pattern" of cardiovascular responses. Some reviewers find SBP reactivity is the most frequent cardiovascular response (Houston, et al., 1986), although several studies have found significant DBP as well as HR responses (cf., Manuck & Krantz, 1986). Therefore, it seems unlikely that the present study represents the final word on the relationships between another psychological variable, MGRS, and cardiovascular reactivity.

Nevertheless, the main findings of this dissertation may be summarized as follows: MGRS is significantly related to SBP reactivity, with no significant difference between the two situations (CPT versus MTI) used to evoke stress. MGRS also correlates with Type-A behavior and hostility; and these are each significant (and overlapping) predictors of SBP reactivity. Independent of MGRS scores, average DBP responses were significantly greater in response to the CPT than in the MTI. HR responses in response to both of the stressor were small, unreliable, and unrelated to MGRS.

Limitations of the Study

Theoretical discussion in this dissertation suggests that gender role socialization affects the development of MGRS in men. The experimental results have been interpreted in this paradigm, implying that MGRS (and Type-A, hostility) leads to increased cardiovascular reactivity and, thus, CHD. Indeed, the results do support these hypothesized relations. However, the assumption of cause and effect between MGRS and reactivity has yet to be demonstrated. It might, instead, be argued that men whose physiology is more reactive tend to develop cognitive attributes of MGRS (or Type-A, hostility). Even the use of careful experimental design, in the present study, does not establish a cause-effect relationship. Only if the independent variable (MGRS scores) was systematically manipulated (like drug levels) would it have been possible to demonstrate cause and effect. Instead, the effects of MGRS were determined by assigning subjects into low, middle, or high groups. The use of such "classification variables" prevents the inference of causality (Keppel, 1982, p. 8).

Given the finding that MGRS scores were significantly related to SBP reactivity, one could ask whether such scores truly represent the population of interest. Might not those men who experience high levels of MGRS be least inclined to reveal their feelings? This possible confound is one which cannot be answered, since self-reports are the only measures available to tap thoughts and attitudes (cognitions). Yet,

the data presented earlier, regarding scale validation and factor analysis of MGRS, seem to offer evidence that MGRS scores reflect the hypothetical construct. Specifically, higher scores on the MGRS scale are associated with greater anger and anxiety, and underlying factors are conceptually congruent with male gender role conflicts. Further, the present findings clearly demonstrate that MGRS scores are not just related to other self-report questionnaires, but predict measureable physiological changes as well.

The relationship between MGRS and systolic reactivity was demonstrated across two stressors, the Cold Pressor Task (CPT) and the Masculine Threat Interview (MTI). These were distinctly different situations; the CPT using a painful physical stimulus, and the MTI involving a stressful social interaction with gender-related overtones. Nonetheless, SBP reactivity was virtually the same in both situations. Thus, the relationship between MGRS and reactivity was interpreted as situationally independent. However, because only two stressful situations were sampled, it would be questionable to assume that no other situations could interact with MGRS to affect SBP reactivity. This study suggests MGRS scores, representing an internal cognitive state, affect reactivity across at least two different situations. Such situational independence may not generalize to all stressors, and the present study does not thoroughly address this question.

Finally, the results of this dissertation are limited by the population from which subjects were drawn. Subjects used in this investigation represented a sample of healthy young men, who were attending college, and who volunteered for the experiment. Therefore, the present findings may not be applicable to men of different ages, at different socio-economic levels, or with different health status. Validity and reliability of the MGRS/reactivity relationship found in this study would have to be replicated in other populations. Yet, it could be argued that a population of young, healthy men provides for a more conservative test of the hypotheses. First, it seems reasonable that gender role conflicts would be more stressful after men enter the workplace, marry, and interact with children. Indeed, there is some evidence for this in case studies conducted by Levinson and colleagues (1978). Second, the presence of pathogenic cardiovascular hyper-reactivity should be easier to demonstrate in patients with diagnosed coronary disease than in young, healthy men. Third, a more heterogenous population would have provided more variance and, hence, a greater likelihood for finding significant differences. Given these observations, there seems little reason to underestimate the generalization of results found in this study.

Directions for Future Research

Suggestions regarding directions for future research are twofold: First, additional investigations are needed on the construct of gender role stress. It has already been established that MGRS is associated with anger and anxiety (Eisler & Skidmore, 1987), but what relations are there with other psychological variables? Perhaps, MGRS is related to mental health problems that are most prevalent in men, such as alcoholism. A recent investigation replicates the anger and anxiety correlations, and also shows a relation between MGRS and health risk behaviors (Eisler, Skidmore & Ward, in press). That is, men with high MGRS scores were more likely to smoke, abuse alcohol, have poor diet and exercise habits, and fail to use seat belts. This dissertation implicates MGRS as a potential risk factor for CHD, via the pathogenic mechanism of cardiovascular reactivity. Are there other somatic health consequences of MGRS? If so, what are the psychophysiological and/or neuropsychological correlates?

Secondly, additional research is needed regarding the construct of cardiovascular reactivity. It is clear that hyper-reactivity is associated with psychosocial stress as characterized by Type-A behavior, hostility, and (now) MGRS. Are other important psychosocial phenomena being overlooked? Does social support, for example, have any influence on the individual's propensity for cardiovascular reactivity? Even

more crucial is the clarification of cardiovascular response patterns evoked under stress. Along these lines, nomothetic approaches may have limited usefulness; researchers may have to take greater advantage of ideographic (within-subjects) designs to uncover individual differences in reactivity. It might also be helpful if data were available to characterize cardiovascular responses to a number of standard stimuli. However, this investigator suspects that certain individual differences, especially in terms of cognitive appraisal, may moderate the physiological responses. More to the point of the present study, and others that investigate correlates of cardiovascular reactivity: Will future research add support to the pathogenic relationship between reactivity and CHD? These questions, at least, deserve careful attention and further empirical investigation.

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APPENDICES

APPENDIX A: CONSENT FORM

The purpose of this study is to examine how minor stressors affect blood pressure changes in men. Students participating is this one-hour experiment will receive one extra credit point for Introductory Psychology (psyc 2000).

The first few minutes of the experiment provides explanation of procedures and blood pressure equipment to participants. Following this, the student completes some questionnaires.

Then each participant will have his blood pressure monitored during different situations: two relaxation/deep breathing periods, a short interview, and a standard cold-pressor task. These situations each last only about five minutes.

The experiment does not involve deception, nor risk of any kind. However, the interview includes questions related to achievement that might embarrass some students. And the cold-pressor task involves the immersion of one hand in cold water for about a minute, and some students might consider this painful.

All information is confidential and will be seen only by the experimenters. The student's name and number are required to insure extra credit; but afterwards these are deleted.

Participation is voluntary and students may discontinue at any time during the experiment. However, extra credit can only be given to students who complete the experiment.

This research project has been approved by the Human Subjects Research Committee and the Institutional Review Board. Questions about this study should be directed to:

Jay R. Skidmore, M.A. 961-6581
Graduate Research Assistant

Richard M. Eisler, Ph.D. 961-7001
Advisor and Principle Investigator

Stephen J. Zaccaro, Ph.D. 961-7916
Chair, Human Subjects Research Committee

I HEREBY AGREE TO VOLUNTARILY PARTICIPATE IN THE RESEARCH PROJECT DESCRIBED ABOVE, AND UNDER THE CONDITIONS DESCRIBED ABOVE.

APPENDIX B: LABORATORY PROTOCOL

Date: _____

Subject #: _____

Substances used today: Cigarettes: _____

Caffeine: _____

Alcohol: _____

Blood Pressure Readings Task	SBP	DBP	HR	Stressor
Introduction	___	___	___	
Relaxation	___	___	___	
Relaxation	___	___	___	
Stressor	___	___	___	_____
Stressor	___	___	___	
Relaxation	___	___	___	
Relaxation	___	___	___	
Stressor	___	___	___	_____
Stressor	___	___	___	
Debriefing	___	___	___	

Comments:

APPENDIX C: NEUTRAL FRIENDLY INTERVIEW

Directions: "Hello, my name is _____."

1. Your name is _____?

2. Where are you from?

   "That's a nice area."

3. What kind of work does your father do?

4. What kind of work does your mother do?

5. How old are you?

6. What year are you in school?

7. What is your major?

   "Oh, that's interesting."

8. What would you like to do after you finish college?

   "Sounds like a good idea."

9. What things do you like to do for leisure?

10. How often do you get to (activity from #9)?

    "It was nice meeting you."

APPENDIX D: MASCULINE THREAT INTERVIEW

Directions: "I need to ask you a number of questions. If you feel embarrassed by a question, you need not answer it."

1. How would you rate your fitness on an A-F scale?

   "Why not a (next lower letter)?"

2. How often do you participate in competitive sports?

   "Just (repeat S's response)?"

3. Are you afraid of losing in competition with other men?

   If no, "Are you sure?"

4. Would you prefer to compete with women?

5. Have you ever worked in a real job, outside of school?

   In no, "Why not?" If yes, "How much? Is that all?

6. How often do you date?

   "Only (repeat S's response)?"

7. Do women intimidate or frighten you?

8. Has anyone ever said you have feminine characteristics?

9. Do you get upset easily, or cry often?

   "Some men are afraid to admit how much they cry."

10. Tell me about the last time you felt upset or hurt.

    Interrupt after 1 minute with ...

    "Sounds like you're more emotional than most men."

APPENDIX E: MGRS SCALE

Directions: Please rate the following items according to how stressful the situation would be for you. Give each item a rating on the scale of 0 to 5, ranging from not stressful to extremely stressful. For example:

A.	Driving a car	0
B.	Discovering you have a serious illness	5
C.	Losing your keys	2

* *

NOT STRESSFUL					EXTREMELY STRESSFUL
0	1	2	3	4	5

* *

1. Feeling that you are not in good physical condition
2. Telling your spouse that you love her/him
3. Being outperformed at work by a woman
4. Having to ask for directions when you are lost
5. Being unemployed
6. Not being able to find a sexual partner
7. Having a female boss
8. Having your lover say that she/he is not satisfied
9. Letting a woman take control of the situation
10. Not making enough money
11. Being perceived by someone as "gay"
12. Telling someone that you feel hurt by what they said
13. Being married to someone who makes more money than you
14. Working with people who seem more ambitious than you
15. Finding you lack the occupational skills to succeed

16. Losing in a sports competition
17. Admitting that you are afraid of something
18. Being with a woman who is more successful than you
19. Talking with a "feminist"
20. Being unable to perform sexually
21. Being perceived as having feminine traits
22. Having your children see you cry
23. Being outperformed in a game by a woman
24. Having people say that you are indecisive
25. Being too tired for sex when your lover initiates it
26. Appearing less athletic than a friend
27. Talking with a woman who is crying
28. Needing your spouse to work to help support the family
29. Having others say that you are too emotional
30. Being unable to become sexually aroused when you want
31. Being compared unfavorably to men
32. Comforting a male friend who is upset
33. Admitting to your friends that you do housework
34. Working with people who are brighter than yourself
35. Getting passed over for a promotion
36. Knowing you cannot hold your liquor as well as others
37. Having a man put his arm around your shoulder
38. Being with a woman who is much taller than you
39. Staying home during the day with a sick child
40. Getting fired from your job

APPENDIX F: FRAMINGHAM TYPE A SCALE

Directions: Place a check mark in the appropriate space after each item.

Traits and qualities which describe you:*

1. Being hard-driving and competitive.
2. Usually pressed for time.
3. Being bossy or dominating.
4. Having a strong need to excel in most things.
5. Eating too quickly.

Feelings at the end of an average day of school or work:**

6. Often felt very pressed for time.
7. Work stayed with you so you were thinking about it after hours.
8. Work often stretched you to the very limits of your energy and capacity.
9. Often felt uncertain, uncomfortable, or dissatisfied with how well you were doing.
10. Do you get upset when you have to wait for anything?

---

* Responses: Very Well, Fairly Well, Somewhat, Not At All

** Responses: Yes, No

APPENDIX G: COOK-MEDLEY HOSTILITY SCALE

Directions: If a statement is true or mostly true, as applied to you, circle the letter T. If a statement is false or usually not true about you, circle the letter F. Try to give a response to every statement.

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 a wrong I feel I should pay him back if I can, just for the principle 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 misfortune in order to gain the sympathy and help of others.

6. It takes a lot of argument to convince 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 getting 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.

16. My relatives are nearly all in sympathy with me.

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

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

19. No one cares much what happens to you.

20. I can be friendly with people who do things which I consider wrong.

21. It is safer to trust nobody.

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

23. I have often felt that strangers were looking at me critically.

24. Most people make friends because friends are likely to be useful to them.

25. I am sure I am being talked about.

26. I am likely not to speak to people until they speak to me.

27. Most people inwardly dislike putting themselves out to help other people.

28. I tend to be on my guard with people who are somewhat more friendly than I had expected.

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

30. People often disappoint me.

31. I like to keep people guessing what I'm going to do next.

32. I frequently ask people for advice.

33. I am not easily angered.

34. I have often met people who were supposed to be experts who were no better than I.

35. I would certainly enjoy beating a crook at his own game.

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

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

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

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

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

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

42. The man who had most to do with me when I was a child (such as my father, step-father, etc.) was very strict with me.

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

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

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

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

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

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

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

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

APPENDIX H: EXPERIMENT STRESS RATING SCALE

Directions: Now that you have completed the experiment, please tell us which sections were most stressful. Rate each section of the experiment according to the following scale.

NOT STRESSFUL					EXTREMELY STRESSFUL
0	1	2	3	4	5

1. The introduction and explanation of procedures. _____

2. Filling-out the questionnaires. _____

3. The deep-breathing exercises. _____

4. The cold pressor. _____

5. The interview. _____

6. Having your blood pressure taken. _____

APPENDIX I: PILOT STUDIES

VALIDITY AND RELIABILITY OF THE MGRS RATING SCALE

Subjects and Method

Data was gathered from 81 subjects, 56 males and 25 females, with regard to the MGRS scale. The participants were predominantly caucasian (97%) and single (95%), with a mean age of 20 years (range of 18 to 28). All subjects were students enrolled in various psychology courses at Virginia Polytechnic Institute and State University. Statistical analyses were performed separately on three subsamples, to answer specific questions about the MGRS Rating Scale.

MGRS Sex Differential

Previous research has shown that men experience greater Masculine Gender Role Stress than women (Eisler & Skidmore, 1987). To verify and replicate this finding, MGRS scores were analyzed in a subsample of 25 males and 25 females. The mean score for males was 88, while the average for females was 60. Results of a t-test comparison (two-tailed, pooled variance) demonstrated that men score significantly higher on MGRS than women ($t = 6.63$, $p < .01$).

MGRS Test-Retest Reliability

It has been assumed that an individual's score on the MGRS scale represents a consistent cognitive set (or, trait) which influences behavior in various situations. To test whether MGRS scores reflect a stable aspect of personality

(developed, in theory, through gender socialization), a test-retest analysis was performed in a subsample of 15 males. The Pearson correlation coefficient compared two sets of scores on the MGRS scale, separated by a two-week period, within individuals. Mean MGRS scores were very similar for both administrations (95 and 92), even through the standard deviations were quite pronounced (29 and 27). Test-retest reliability was high ($r = .93$, $p < .01$). Thus, while MGRS may vary considerably in different men, it seems to reflect a stable, consistent cognitive trait within each individual.

MGRS, Type-A, and Hostility

It was earlier suggested that masculine socialization might underlie development of Type-A behavior and hostility which have been associated with CHD. If negative aspects of masculine socialization, represented by MGRS, are to be implicated in the Type-A/CHD relationship, then MGRS should be positively correlated with Type-A behavior and its most "toxic" component, hostility.

Comparisons were made, therefore, between the MGRS scale, the Framingham Type-A Scale (FTAS), and the Cook-Medley Hostility scale (CMHO). Refer to Appendices E to G to examine these scales. Pearson correlations were computed in a subsample of 16 men. Results of these correlations are supportive of the hypothesis offered above; specifically, that Masculine Gender Role Stress is associated with both

the Framingham measure of Type-A ($r = .68$, $p < .01$), and the Cook-Medley measure of hostility ($r = .54$, $p < .05$).

LABORATORY HABITUATION AND THE NEUTRAL FRIENDLY INTERVIEW

From the subsamples used in questionnaire analyses above, 15 male volunteers were recruited to assess (1) the time needed for habituation to blood pressure measurements, and (2) whether reactivity occurs in response to a Neutral Friendly Interview (NFI, refer to Appendix C). Importance of this latter issue will be clarified below.

Systolic blood pressure (SBP) was assessed in each subject at six points across time; specifically, measures were taken at 2, 5, 10, 15, 20, and 25 minutes. Subjects were instructed to sit quietly and relax (breathing slowly and regularly) throughout the assessment period. However, each subject was interrupted just prior to the 15-minute-measurement by a female research assistant who conducted the Neutral Friendly Interview. Therefore, the SBP measurements from 2 to 25 minutes (except the 15 minute reading) provide data to determine when the baseline stabilizes. The SBP measurement at 15 minutes, compared to the prior reading, would represent whether subjects responded to the NFI.

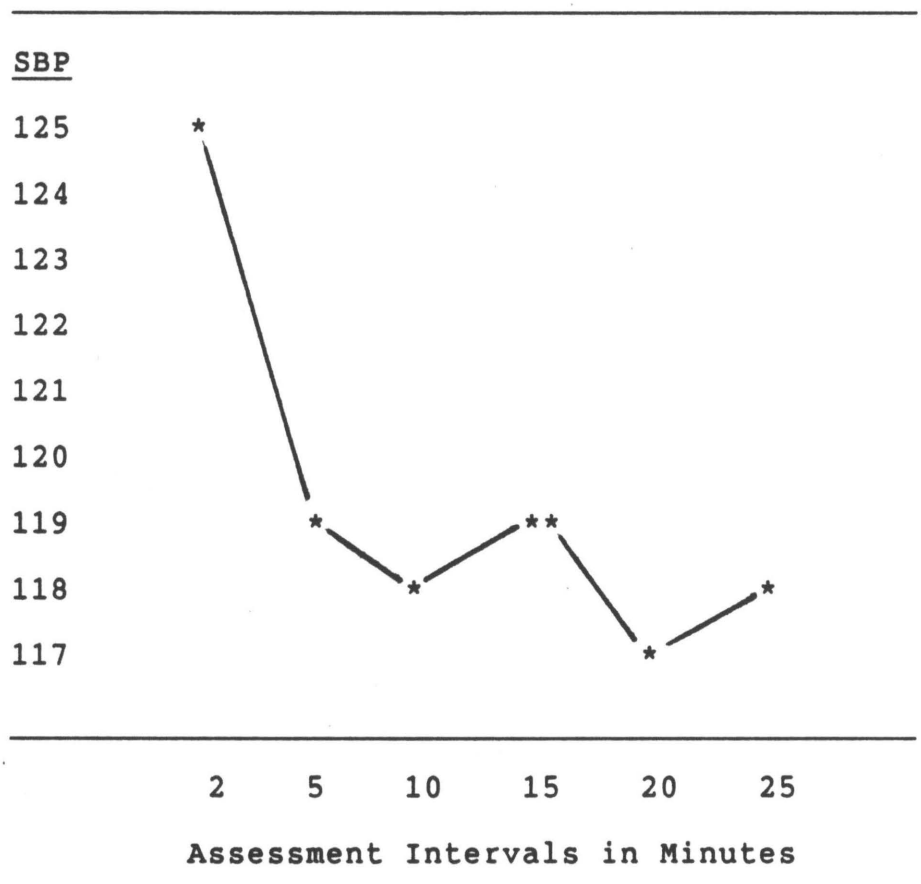
Habituation to Laboratory Procedures

As illustrated below in Figure 2, subjects habituated to the laboratory environment and procedures (i.e., blood pressure measurement) within about 5 minutes. Average

systolic blood pressures at 2, 5, 10, 15, 20, and 25 minutes were, respectively, 125, 119, 118, 119, 117, and 118.

Reactivity to Neutral Friendly Interview

The second issue addressed by this data, and shown in Figure 2, is whether subjects are reactive to the Neutral Friendly Interview (NFI). The mean systolic reading at 15 minutes (immediately post-NFI) is only 1 mm Hg higher than the prior baseline. Such a small change is most likely an artifact of blood pressure fluctuation. This demonstrates that substantial reactivity is very unlikely in response to "nonspecific" effects of the interview situation.



** Mean Response to Neutral Friendly Interview

Figure 2: Pilot Data: SBP Across Time

LABORATORY ASSESSMENT OF REACTIVITY TO STRESSORS

Subjects and Method

From the subsamples used in questionnaire analyses above, 9 male volunteers were recruited to participate in laboratory assessment of cardiovascular reactivity. Each subject was told beforehand that the experimental session lasts about 30 minutes and includes a brief interview, the cold pressor task, and relaxation periods. They were also told that blood pressure and heart rate measurements would be taken about ten times over the course of the experiment. During this introduction, an initial blood pressure and heart rate reading was taken to help habituate the subject.

There were four distinct phases of assessment: (1) the first relaxation baseline, (2) the first stressor, (3) the second relaxation baseline, (4) the second stressor. Each phase lasted for no more than five minutes. The stressors were (1) a standard cold pressor test (CPT), where subjects immerse one hand in ice-cold water for about two minutes, and (2) a 10-question Masculine Threat Interview (MTI) conducted by a female research assistant. Stressors were administered to subjects in counter-balanced order to equalized any potential cumulative effects. After assessment, all subjects were debriefed.

Blood pressure and heart rate measurements were taken twice during each relaxation baseline and stressor period,

and averages were computed to represent each phase. Cardiovascular reactivity was defined as the difference between mean baseline and stressor measurements for systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR). Each of these three measures of were used to measure reactivity associated with both the CPT and MTI. Pearson correlations were computed between all independent measures (i.e., the questionnaire data) and all dependent measures (i.e., SBP, DBP & HR for CPT & MTI). It should be noted that, due to the small sample size, most of the correlations were not significant at traditional levels. The data is reported, nonetheless, to reveal the trends that support the direction of the proposed dissertation.

Stressor Task Differences in Reactivity

Both stressors produced the largest response for systolic pressures; about 19 mm Hg for the CPT, and 17 mm Hg for the MTI). The diastolic responses averaged a bit lower, while heart rate responses were insignificant. For systolic pressure, reactivity was very similar across both stressors. However, for diastolic readings, the magnitude of reactivity was notably higher for CPT than for MTI. These results are illustrated in Table 12 below.

Table 12: Pilot Data: Mean Reactivity to Stressors

	SBP*	DBP*	HR**
Cold Pressor Task	19	18	2
Masculine Threat Interview	17	6	2

* Measured in millimeters-of-mercury (Hg mm)

** Measured in beats-per-minute (bpm)

Reactivity, MGRS, Type-A and Hostility

Correlations were computed between reactivity scores, in both stressor conditions, and the questionnaire scores for MGRS, Type-A (FTAS), and hostility (CMHO). Reactivity measures include systolic and diastolic blood pressures; the heart rate readings were not included since means in the previous table show practically no reactivity to either stressor.

Systolic reactivity is weakly correlated with the MGRS in response to the cold pressor task ($r = 25$), but not in response to the interview. SBP responses were not related to the FTAS or the CMHO. However, diastolic reactivity was consistently related to MGRS, Type-A, and hostility. This pattern held for both the Cold Pressor Task (CPT) and the Masculine Threat Interview (MTI). DBP correlated .44 (CPT) and .56 (MTI) with MGRS; .23 (CPT) and .55 (MTI) with Type-A; .27 (CPT) and .69 (MTI) with hostility. These results are shown in Table 13 below.

Table 13: Pilot Data: Reactivity and Questionnaires

	MGRS	FTAS	CMHO
Cold Pressor Test			
SBP	.25*	.09	-.11
DBP	.44*	.23*	.27*
Masculine Threat Interview			
SBP	.05	.11	-.05
DBP	.56*	.55*	.69*

* Correlations above .25 were considered meaningful; with the small n, significance tests were not used.

SUMMARY

Pilot data was gathered from 93 subjects, who were divided into smaller subsamples to test various questions relevant to the dissertation proposal. By testing only one hypothesis per each subsample, the problem of "experiment-wise error" (Winer, 1971) was avoided. Interpretation of results is limited by both the small sample sizes and the simplicity of statistical analyses (i.e., correlations). Yet, the pilot testing allowed practice and refinement of experimental procedures, and provided tentative support for the direction of the proposed dissertation.

First, results of pilot studies above indicate that the MGRS scale is gender-specific to men, highly reliable over time within individuals, and clearly related to Type-A and hostility.

Second, habituation to the laboratory environment and procedures appears to occur after about 5 minutes. In other words, based on SBP (which is generally more variable than DBP or HR), the average subject will demonstrate an initial inflated reading (at 2 minutes) and will then present a stable baseline at 5 minutes and after.

Third, subjects showed practically no reactivity to a Neutral Friendly Interview (NFI) but demonstrated substantial reactivity to the Masculine Threat Interview (MTI). The mean systolic response to the NFI was 1 mm Hg

(probably an artifact), whereas the average systolic response to the MTI was 17 mm Hg. This finding supports the author's assumption that the MTI be regarded as a "stressor" due to attributes beyond simply the interaction of two people in conversation.

Further, these studies support the feasibility of using both the Cold Pressor Task and Masculine Threat Interview as stressors to elicit cardiovascular reactivity. The observed blood pressure responses of 6 - 19 mm Hg would probably be statistically significant, as well as clinically meaningful, if they can be demonstrated in a reliable sample. Finally, these pilot studies support the proposed dissertation's main hypothesis that MGRS scores would be related to measures of cardiovascular reactivity.

APPENDIX J: INDIVIDUAL DATA

				CPT Reactivity			MTI reactivity		
ID#	MGRS	FTAS	CMHO	SBP	DBP	HR	SBP	DBP	HR
1	88	3	28	17	11	-2	22	5	-6
2	75	4	21	33	25	0	19	9	10
3	100	5	13	-1	16	-3	19	3	4
4	85	6	19	43	36	11	23	6	-1
5	68	2	18	7	12	3	10	10	10
6	101	6	27	34	35	4	19	8	6
7	66	5	13	13	9	5	9	-3	-2
8	50	4	15	18	27	-6	11	9	-9
9	53	3	13	17	23	13	10	12	-8
10	84	5	22	27	18	3	19	9	5
11	104	5	28	31	10	-4	31	-3	-2
12	62	3	16	17	21	-6	7	4	11
13	90	1	16	18	20	-1	22	14	5
14	72	4	17	5	0	-6	14	-7	4
15	74	7	27	12	8	20	11	0	13
16	55	4	23	10	2	1	9	10	-4
17	116	4	25	18	10	-8	26	0	-5
18	91	4	17	15	7	1	23	7	-2
19	107	8	19	28	13	1	32	3	-1
20	109	6	28	21	17	13	10	6	0

				CPT Reactivity			MTI reactivity		
ID#	MGRS	FTAS	CMHO	SBP	DBP	HR	SBP	DBP	HR
21	123	7	26	18	30	2	28	19	0
22	71	6	27	1	1	-6	2	-1	-4
23	97	6	23	15	-8	11	23	-10	15
24	103	5	23	5	6	-5	23	3	-7
25	87	8	30	21	12	-12	23	12	-2
26	110	7	30	29	20	10	21	2	-3
27	92	8	19	29	12	9	16	8	4
28	118	6	19	11	1	-2	24	7	13
29	85	3	18	5	0	3	16	-1	6
30	114	5	29	11	12	3	13	2	11
31	84	6	16	23	15	-1	15	2	0
32	112	7	19	24	18	21	6	12	3
33	74	2	23	8	5	0	3	-2	-3
34	82	2	9	18	7	16	11	-2	-13
35	71	1	20	18	8	-6	21	9	-8
36	88	3	17	4	9	-5	10	8	1
37	113	8	22	20	12	1	20	1	-2
38	77	2	11	11	9	-5	11	10	1
39	113	6	20	15	20	-2	19	3	-4
40	100	6	22	30	29	1	18	0	9

				CPT Reactivity			MTI reactivity		
ID#	MGRS	FTAS	CMHO	SBP	DBP	HR	SBP	DBP	HR
41	66	8	22	12	14	-5	19	-7	1
42	115	6	25	24	21	2	19	5	6
43	139	10	26	18	34	0	16	19	0
44	78	5	21	3	2	1	18	9	-4
45	99	5	28	25	20	-1	14	8	3
46	72	4	12	6	5	-5	10	12	2
47	47	0	26	7	6	5	17	2	-8
48	108	7	22	6	8	5	14	3	1

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