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THE EFFECTS OF A WORKSITE STRESS MANAGEMENT PROGRAM ON 24-HOUR BLOOD PRESSURE

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ABSTRACT

THE EFFECTS OF A WORKSITE STRESS MANAGEMENT PROGRAM ON 24-HOUR BLOOD PRESSURE

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A review of the worksite stress management literature is presented. In addition, some suggestions are made to relate the comparative stress management technique literature with current worksite stress management program design and evaluation. The current evaluation study measured thirty-four subjects' blood pressure for two 24-hour periods. It was hypothesized that blood pressure and/or heart rate would decrease in the actual environment as a result of the stress management program. The cardiovascular variables did not change significantly in the predicted direction. The results revealed a trend toward greater reports of "Accomplishing Things" by male stress participants. It was noted that females in the comparison group reported higher stress and frustration levels which continued from work into the home. Reductions of blood pressure as a result of participating in a worksite stress management program has yet to be demonstrated in the actual environment.

This effort is dedicated to the memory of my friend John D'Cruz who supported my efforts, and I his, until his untimely death due to a drunk driver. This effort is also dedicated to the memory of my father, Thomas Monro Brown.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Occupational stress management programs are growing in the United States as part of the dramatic increase of health promotion programs aimed at increasing employee health and fitness (Glasgrow & Terborg, 1988). Although claims are made that prepackaged stress management programs are successful and provide benefits to employees, recent empirical studies call such claims into question.

Various studies have linked job stress to physiological precursors of coronary heart disease (Kasl & Cobb, 1970; House, 1974). Some psychosocial variables have been noted recently to be related to coronary heart disease and are now beginning to receive wide attention (Thiel, Parker, & Bruce, 1973; Jenkins, 1976). The most extensive work in linking behavior factors with later cardiovascular disease has been carried out by Friedman, Rosenman, and their colleagues (e.g. Friedman & Rosenman 1960). However, the relationship between psychological and physiological processes as they relate to health and wellbeing is unclear.

Though research toward understanding the relationship between psychological and physiological variables and later cardiovascular disease has taken place, relatively little attention has been given to worksite related research. Nevertheless, certain factors in the work environment do contribute to greater stress reactions. Such factors include deadlines, role conflict, role ambiguity, overload, boredom

or "work underload", under-utilization of abilities, responsibility for lives or things, lack of job security, and physical discomfort on the job (Caplan, Cobb, French, Van Harrison, & Pinneau 1975). Temporal factors are important as well, whether one is employed as a shiftworker or has to deal with machine pacing negatively influences workers (Tasto, Colligan, Skjei & Polly, 1978).

Job stress research has typically focused upon dependent variables such as job satisfaction, motivation, performance, and job withdrawal behavior. However, the relationship between job stress and mental and physiological outcomes have not been studied extensively. The present study used Lazarus' (1966) model which emphasizes individual differences in perception of threat and the importance of adaptive coping mechanisms in stress management. A major assumption underlying this study is if inadequate coping measures are being used, these strategies may have a negative impact on physiological and muscular-skeletal systems resulting in poorer health. It is still unclear whether there exists an overall personality type that is prone to poorer health in general or whether certain traits are related to specific diseases. However, by examining the concomitant psychological and physiological variables in individuals trying to change their coping strategies, one might begin to observe the effects due to psychological interventions on the physical substrate. One variable of interest was change in 24-hour

systolic blood pressure as a result of participation in a stress management program, since systolic blood pressure, as measured by ambulatory monitoring, has been found to be related to later target organ damage (Perloff, Sokolow, & Cowan, 1983).

The goal of the current study was to determine whether reductions in physiological arousal occur as a result of participation in a stress management program. The study involves viewing the subject from multiple perspectives at a given point in their workday and aggregating these observations across a 24-hour period during two separate working days. The study investigated whether participation in a stress management program reduces systolic blood pressure (SBP) and diastolic blood pressure (DBP) and heart rate (HR) for participants in relationship to a comparison group during the workday, while at home, and during sleep. Questions also were raised about daily self reports of "stress" defined as feeling tense, rushed, and irritable. It is assumed that effective coping is predicated on overcoming a sense of frustration. Therefore the study attempted to measure reductions in frustrations. Conversely, goal accomplishment reflects a positive measure of employee productivity in the workplace and may increase as a result of the stress program.

Before presenting a review of the worksite evaluation studies, a brief review of relevant extant theories will be presented.

REVIEW OF EXTANT THEORIES

The following review will cite the contributions from Cannon and Selye as well as the classic work by Henry and Stevens that helped to integrate these prior observations. Their notion of "controllability" over stressful events becomes a critical distinction to make when applied to human stress problems. The work of Mason is also relevant toward a greater understanding of the role of affect in general arousal. Mason's work (Mason, 1971; Mason, 1968, pt. 2) is an attempt to integrate the findings within the field of psychoendocrinology and is particularly relevant toward clarification of the "Nonspecificity Hypothesis" introduced by Selye. This clarification of the nonspecificity hypothesis has implications for further psychological and physiological research and emphasizes the role of affect in the stress process. In addition to the role of affect, Lazarus' concept of "Threat Appraisal" will also be reviewed for it is particularly relevant in designing effective stress management programs in the worksite. Both "Threat Appraisal" and affective responses are assumed to interact to produce arousal and therefore are important features to understand when one intervenes to decrease arousal. The Environment-Fit, Stressful Life Events, and Type A Behavior research domains are particularly relevant toward the elucidation of the impact of situational and trait factors on individual health and productivity. Therefore, beginning with Cannon's

contributions, some historical background will be given in order to help understand how these theoretical concepts of stress are related to worksite applications.

Walter Cannon's pioneer study of the involvement of adrenal medullary functioning and the concept of "emergency functions", or the "fight or flight" syndrome, set the groundwork for later study of physiological stress responses to external stimuli in both animals and humans. Cannon (1935) focused on the limits involved in withstanding stress using the concept of homeostasis. He believed that there was a "critical stress level" which, once challenged, could result in a breakdown of the stable qualities of the organism.

When Hans Selye published his observation of a "tripartite" reaction in a 1936 paper, he noted adrenalcortical involvement in rats resulting from various "nocuous agents" after an administration of hormonal extract. At the time of these earlier observations Selye was in search of an elusive sex hormone derived from ovarian tissue and hoped to inject a pure extract of such a "hormone" to observe its effect. Contrary to his expectations, this "hormone derivative" caused observable changes in his subjects, but so did other substances such as formalin, extracts of kidney, pituitary, spleen, and placenta tissue. However, he noticed that a commonality existed among the reactions to the noxious agents; in all cases there appeared: 1) adrenal cortical enlargement 2) involution of the thymicolymphatic structures

and 3) bleeding in the stomach and duodenal lining. He called this reaction a "nonspecific response" and noted a temporal relation in the development of the response which he called the "general adaptation syndrome" (GAS). Selye outlined three temporal phases of progression within GAS. The first phase of the syndrome is the alarm stage whereby the organism responds to the introduction of some "nocuous" agent. If the nocuous agent doesn't terminate, than the organism goes into the next phase, "the stage of resistance", which is followed by the "stage of exhaustion".

Selye believed that the most important aspect of his nonspecific response theory revolved around finding the "first mediator" mechanisms within the body. He thought that messages to the brain were constituted in the form of a neural or hormonal system responding to a nocuous agent. This "first mediator" would alert the brain which, in turn, would produce a nonspecific response involving the pituitary-adrenal cortical hormone axis.

Henry and Stephens (1977) made an observation that helped to synthesize the two apparently different views of nervous system reaction to external stress proposed by these two theorists. Cannon was able to identify general patterns of responses to stress. He was able to demonstrate that the sympathetic nervous system and the adrenal medullary system were responsive to signs of stress in animals (Cannon, 1929). His "fight or flight" response to threat was shown to be

associated with the adrenal medullary system. They argued that the important factor which differentiated the responses proposed by Cannon and Selye, that of adrenal medullary response (Cannon) and adrenocortical response (Selye), is distinctly related to the amount of control the subject has over threat. Henry and Stephens have shown that when an animal is challenged, but given the opportunity of having control over its environment, it shows increased physical activity and aggressiveness and responds with increased activation of the amygdala and sympathetic adrenal medullary response. However, when subjects were not given control, but were consistently immobilized and defeated, their physical activity reflected withdrawal and the adrenocortical hormones described by Selye were highly activated (Henry & Stephens, 1977). (For further information concerning this phenomena, see Frankenhauser, 1975, 1979, 1980.) Frankenhauser has shown that monotonous or aggressively competitive performance tasks, which require effort and distress or negative affects, are associated with activation of both adrenergic adrenocortical systems (Frankenhauser, Lundberg and Forsman, 1980). However, situations that require effort without distress, activate the sympathetic or adrenergic system and suppress the secretion of cortisol. It appears that when the condition of distress is present, the subject is more vulnerable to increased activity and perhaps later target-organ damage. Certain well known experiments have illustrated such a point: Corley and

his colleagues have conducted experiments with squirrel monkeys which were strapped to chairs for eight hours a day. The task for the monkeys who were in the effort and distress condition was to turn off a light once a minute in order to prevent shock delivery. These monkeys went on to develop hypertension and myocardial fibrosis. Conditions which represent excessive sympathetic nervous activity. In the monkeys which were in a distress only condition, (distress without effort) and incapable of responding, five developed bradycardia and four died in asystole (Corely, Manuc, & Shiel, 1975). Therefore, controllability over stress is an important factor to consider when evaluating the effects of stress.

In Mason's (1971) paper on the re-evaluation of the non-specificity concept, he noted that in the 1960's psychoendocrinological studies questioned the validity of Selye's "nonspecificity hypothesis" and the notion of first mediators that are responsive to nocuous external agents. Research has indicated that there is an increased sensitivity of the pituitary-adrenal-cortical system to psycho-social stimuli, even to relatively subtle cues. Emotional stimuli have been observed to be potent elicitors of pituitary-adrenal cortical activity (Mason, 1971). One of the major weakness of Selye's theory, which Selye also believed was the most important aspect for future research, was his notion of "first mediators". Though Selye was unable to locate "first mediators" of the stress response, he did believe that there

might be a lack of some important blood constituent which cells used up when they functioned. Counter to this notion, Mason (1968) believes that the first response system might be the psychological apparatus involved in emotional arousal which is commonly activated when animals are exposed to "noxious stimuli".

This also marks a shift in integrative levels from the simple "physiological arc" which involves afferent inputs to the endocrine pathways in the lower brain centers to the involvement of more complex "psychological processes" which are involved with emotional arousal. Mason also points out that the non specificity hypothesis is not consistent with the physiological homeostatic formulation of need determining response. Responses are organized to be adaptive in nature and are thought to be selectively organized. He cites the example of thermoregulation. It seems unlikely that there would be some peripheral biochemical or physiological adjustment that would be "generally adaptive" yet would serve diametrically opposed needs such as heat and cold -- common stressors. It appears more likely that when a psychological dimension is added motor behavior is elicited which can work in favor of the organism's attempts to adapt to heat and cold. This greater exertion would promote increases in hormonal activity to promote energy for struggle. Therefore, all hormones may respond to multiple stimuli in a nonspecific manner, but one hormone does not respond to all stimuli

nonspecifically as Selye suggests.

It wasn't until Richard Lazarus published his classic book, "Psychological Stress and the Coping Process" in 1966 that an organized psychological perspective began to develop which emphasized the importance of the individual's perception of stress. Lazarus' proposal emphasized the critical involvement of psychological processes rather than identification of a single noxious agent and subsequent response. He tried to integrate findings within the field of psychology and reconceptualize the stress-disease process as one which involves a critical link -- "threat appraisal". He made the proposition that one's "appraisal of threat" made a critical difference in one's response to stressors. Hence, with all other things being equal (i.e. the situational stressor), the critical psychological element within the pathogenesis of stress disorders is based upon one's perception of threat.

Lazarus (1966) has pointed out that as we move up the phylogenic scale, behavior becomes increasingly dependent on learning and less on instinctive, built-in mechanisms. He argues that we should define psychological stress as threat, meaning that threat is the anticipation of future confrontations with some type of harm that is based primarily on cues which are appraised by higher cortical cognitive processes (Lazarus, 1966). Threat involves anticipating future events thought to be harmful and it is brought about

by cognitive processes involving perception, learning, memory, judgement, and thoughts. Threat involves a stage of anticipation before there has been any real damage. Cues concerning what can be done to cope with anticipated harm are sought after by the individual. Actual confrontation signifies the occurrence of the anticipated event. If the individual is unable to discriminate between benign and threatening situations, than the individual may be functioning in a distorted manner, possibly leading to more chronic problems. The individual's belief system aids in the appraisal process which is actually a process of making judgments. If one can recognize threat and act to neutralize it one may be successful in decreasing its likelihood of occurrence. From Lazarus' point of view, threat is the product of appraisal, and the actions aroused by threat may be regarded as coping processes. Actions that are aroused by threat appear to be related to the emotions of anger and fear, which, in turn, may promote problem solving.

Given this overview of the development of theory related to the stress response itself, it is important to take into consideration other psychological factors such as individual differences, frequency and intensity of stress events, and the potential to predict "person-environment" fit based upon individual and environment factors which are involved in predicting adequate functioning. The characteristics of the person and the situation and the perception of the situation

by the person may help us to have a clearer understanding of how to utilize a stress-disease model.

Type A Behavior Pattern

Type A behavior pattern is one of the few personality variables shown to play a role in developing illness. Type A individuals tend to be aggressive, ambitious, time-urgent, impatient, and competitive in response to environmental challenge. Epidemiological studies of Type A behavior have shown that it is strongly related to coronary heart disease. Perhaps the most widely cited study is the Western Collaborative Group Study (Rosenman, Brand, Sholtz & Friedman, 1976). The most notable finding of this study is the 2:1 risk factor due to Type A behavior which was found to contribute toward later cardiovascular disease, even when risk factors such as blood pressure, serum lipids, age, cigarette smoking, and parental history of CHD are controlled for. Of the general descriptors of the Type A behavior pattern, potential for hostility, vigorous voice stylistic, competitiveness, and impatience significantly discriminated between those who went on to develop cardiovascular disease and those who did not (Matthews, Glass, Rosenman, & Bortner, 1977). Jenkins (1976) provides an overview of the relationship between Type A behavior pattern and cardiovascular disease.

Type A behavior is related to sympathetic nervous system arousal, in particular, Type A persons show an increase in

catecholamine during the working day (Friedman, St. George, Byers, & Rosenman, 1960) and employed male subjects respond with greater blood pressure and plasma epinephrine compared to Type B subjects when challenged by a TV video game while playing with a confederate competitor (Glass, Krakoff, Contrada, Hilton, Kehoe, 1980). Glass et al. (1980) noted the importance of the competitive nature of the challenge for a given task. Using a "non harassment condition" and a "harassment condition" where a confederate berated the performance of the subject, a difference arose between Type A and Type B individuals during the harassment, but not the nonharrassment condition. Differences in HR, SBP, and plasma epinephrine were demonstrated. Henry and Stephens (1977) noted that Type A individuals seem to be particularly challenged if their control of a situation is threatened. Such evidence suggests that Type A behavior is associated with excessive sympathetic arousal, as mentioned above, and such arousal appears to involve the adrenergic system which in turn is associated with related changes in blood pressure and heart rate.

Dembroski et al. (1979) also found that potential for hostility correlated significantly with enhanced cardiovascular arousal only in Type A subjects. Further, Type A subjects with higher potential for hostility scores showed cardiovascular arousal to tasks under both minimal and maximum challenge instruction conditions (Dembroski et al., 1979).

Type A females have also been shown to be at risk for cardiovascular disease, like their male counterparts (Haynes, Feinleib, & Kannel, 1980). However in laboratory testing, Type A females typically do not show the same pattern of differences as those with Type A and Type B males. For example, MacDougell, Dembroski, and Krantz (1981) tried to replicate the results in Type A females which were found in Type A males mentioned earlier. Type A females did not respond as much as the males did in a reaction time test, however, they did respond similarly to a cold pressor test. Perhaps more interesting is that Type A females scoring high on potential for hostility showed greater SBP response compared to both Type A females who scored low on this measure and Type B females.

Frankenhauser (1979) has noted a sex difference in coping given the lesser degree of responding to achievement demands between Type A women and Type A men. Frankenhauser (1979) has noted that sex differences in catecholamine excretion are minor during rest, however, discrepancies arise during challenges. These differences in arousal were interpreted to be due to different manners of coping with challenge. This, in turn, may explain the sex difference found in cardiovascular disease statistics. Frankenhauser noted a prior study conducted by the author (Collins & Frankenhauser, 1978) whereby women who have adopted a nontraditional female role show increases in epinephrine response almost equal to

their male counterparts. Like Lazarus, Frankenhauser stresses the importance of perception of the event as a vital element in development of later illness processes.

In summary, Type A males appear to respond to tasks defined as challenging more so than Type B males. Among Type A males, potential for hostility indicates greater sympathetic nervous system response even when the task has been defined as minimal challenge. In other words, regardless of the external instruction set, these Type A males react with greater cardiovascular responses. Also, there appears to be some differences between women and men in responses to laboratory stressors. However, women in general may appear to have a more "economic" manner of responding to such challenges due to prior learning.

Type A individuals also tend to use denial as a means to cope with challenge. Pittner and Houston (1980) found that Type A individuals tended to use cognitive coping strategies of minimization or denial of difficulty in laboratory tasks, even though their physiological arousal was higher than Type B's. Therefore, Type A individuals may deny the extent of impact a stressor is having on them and continue to expend energy to cope with the stressor while perceiving it as something to overcome.

Person-Environment Fit Theory

The Person-Environment Fit theory attempts to elucidate the major variables involved in transactions between the individual and their environment. The model, first proposed by French and his colleagues (French & Caplan, 1972; French, Rodgers, & Cobb, 1974) attempts to predict the best fit between the individual and environment. In order to predict this "fit", certain assumptions concerning person-environment transactions are discussed. I will briefly outline the basic assumptions and define basic terms used in this theory since it is one of the most frequently cited theories involving the complex interrelatedness between employees and their environment.

Person-environment fit theory posits two types of fits: "needs-supplies" and "abilities-demands". "Needs-supplies" implies a fit between the individual's needs and environmental supplies of opportunities to meet such needs. "Abilities-demands" fit emphasizes the demands which are placed upon the individual by the environment. Little work has actually been done to distinguish the "needs-supplies" and "abilities-demand" fits. Such a distinction is needed in order to differentiate the need of the individual from the demand of the environment. In a job situation, for example, the need for the supply of job opportunity which satisfies the need for job satisfaction is a differing perspective from the perspective of the employer who may emphasize the ability of

the employee to meet job demands. "Fit" may be defined based upon what perspective one takes.

The model also postulates a means by which one can measure the individual's accuracy of self awareness and their contact with reality. This involves measuring the subjective and objective component of person-environment fit. Assuming that one can measure the objective component of the person and environment (without bias) and assuming individuals can subjectively rate themselves and their environment (which includes bias), then one would be able to find a correspondence between objective and subjective assessments leading to a statement of how accurate one's self awareness and "contact with reality" is (when the correspondence is similar between subjective and objective ratings of the person). The basic assumption of the theory is that there are commensurate properties of the person and environment. When the two aspects of person-environment fit are commensurate with each other, we can predict that the two will work together resulting in a positive outcome. How one is able to measure the objective components of person and environment will remain to be demonstrated. Regardless of the measurement difficulty, the conceptualization is useful when trying to understand individuals' relationships to their environment. French and his colleagues predict that measurement of the commensurate qualities of the environment (including stressors in the environment) and the person will allow us to view how

individual perceptions of stress influence the individual's response. The person's perception is thought to be an important intervening variable which is consistent with observations made by Lazarus (1966).

The model is rather straightforward even though it becomes increasingly complex as it attempts to account for relationships between more and more possible dimensions of subjective and objective events. The main emphasis is in the accurate measurement of the critical variables outlined above. Hopefully future research will help to establish an accurate perspective of the impact objective worksite stressors have on individuals' responses.

Life Events Research

Life events research has generated a lot of information concerning the relationship of external events to the individual's psychological wellbeing and physical health status. Stress has often been defined as a stimulus, at times as the response to a stimulus or situation, and still at other times an inner state experienced by the individual. In Life Events Research most researchers commonly refer to "stress" as a stimulus experienced over the course of the normal life span. Borrowing from psychophysics, it is a field that tries to quantify the perceived magnitude of effect that a given "stressful" stimulus has upon the individual. The assumption is that greater amounts of perceived stress differ in

magnitude from other life stressors and has a differential impact on the individual. It is not known whether these stressors have an additive or synergistic effect on the individual, but none the less, the impact of the stressful stimulus is thought to result in a differential impact upon the individual compared to a less stressful or more stressful event. This reflects a major concern in the area, what are the pathological effects of stressful life events? A second central issue concerns the elucidation of the properties or conditions that differentiate the more stressful life event from the less stressful one (Dohrenwend & Dohrenwend, 1974).

The Social Readjustment Rating Scale, developed by Holmes and Rahe (1967), continues to be one of the most widely used research instruments and has generated various other Life Stress instruments in efforts to specify the temporal relationship between stressful life events and onset of illness. However the field has been bogged down by methodological problems which prompts the question of whether the major focus in methodological improvements should be upon psychometric instruments or improvement of research design. Kasl (1983) has noted that much of the research has involved improvement of instruments which are not measuring constructs such as depression or anxiety, but of events thought to be related to health. Kasl, speaking from an epidemiological perspective, asks whether the current priority upon improvement of instruments should come before better research

design if the goal is to describe the relationship between life events and disease onset.

The problem of defining stress arises clearly here. The fact that there is no unilateral agreement that the term stress refers to a discrete construct is a major problem in the field. Is stress an environmental condition, an appraisal of an environmental condition, a response to an environmental condition, or a relationship between the environmental demands and the individual's ability to meet such demands? In Life Events Research, current effort is aimed at refinement of what classes of stressors exist within the enormous domain of "stressful stimuli". At present, however, researchers are unable to state confidently that life events, aside from individuals' perceptions of such events, cause pathological processes in individuals. Such a statement could only occur under the conditions of an experimental prospective study design and even this attempt is complicated by what "baseline" one uses prior to measurement.

Dohrenwend and Dohrenwend (1981b) have proposed a causal model which would aid in elucidating how life events operate in the etiological process. Kasl (1983) has noted that this attempt may be useful in assessing "a) no aetiological role for life events; (b) life events entering in spurious associations only; and (c) life events as a consequence of health status changes" (Kasl, 1983; p. 81). Kasl (1983) further argues that Life Events research needs to account for

the individual within the life event context more so than it has in the past. He argues that life events may be thought of as risk factors since the evidence does not suggest that they are causal components to later disease or death outcomes. Kasl's argument is one that redirects the focus toward viewing life events and hassles as a part of a life cycle dynamic. Developmentally, we all go through various life event changes, many of which are expected and thought normal, albeit stressful. However, if these normal life events do not occur, than one might ask if their absence is not more of a stressor. Wershaw and Reinhart (1974) have even gone further to suggest that life events research be abandoned since the focus is upon stimuli apart from the individual and the predictiveness of separable events to disease onset has not been largely supported.

Wershaw and Reinhart's call preceded more recent findings that question the role of Stressful Life Events in the disease process. Kasl (1983) notes that the effects of bereavement on mortality has been the most consistent finding in the life stress literature, citing Helsing and Szklo (1981), Susser (1981b), and Satariano and Syme (1981) (cited in Kasl, 1983), yet he notes that such findings have been challenged by the prospective studies of Feniwick and Barresi (1981) and Heyman and Gianturco, (1973) (cited in Kasl, 1983). Therefore, the life events research domain appears to reflect inconsistent findings and must account more fully for how life events are

involved in later indicators of health status.

Given these major theoretical frameworks, the next section will review worksite stress management evaluation studies. The various ideas reviewed here are related to current research in worksite stress issues. The particular focus of this study is to utilize ambulatory monitoring as a potential technology to aid in observing in vivo stress responses as outlined by these major theorists.

REVIEW OF THE WORKSITE STRESS MANAGEMENT PROGRAM EVALUATION LITERATURE

The goal of comprehensively evaluating the effects of any given worksite stress management intervention involves assessment of cognitive, behavioral, affective, and physiological variables. A further goal is to evaluate the effect of the intervention on work-related variables such as job stress and job satisfaction and organizational perceptions and performance indexes. The orientation of the current study is toward providing efficacy information, however, process information is also of interest to aid in understanding how the impact of stressors are mediated by the individual while on the job and while at home.

Before preceding to examine worksite stress management outcome studies, it is important to discuss briefly the "specific effects" hypothesis and the alternative hypothesis, the "relaxation response" hypothesis in order to provide a conceptual context for evaluating cognitive-behavioral stress management interventions in the worksite.

A Brief Synopsis of the Comparative Empirical Literature of Stress Reduction Techniques

In a review by Lehrer and Woolfolk (1987) the authors examined the comparative empirical literature of stress reduction techniques. They specifically examined the question of whether stress techniques are interchangeable or whether

they have specific effects. Davidson and Schwartz (1976) (cited in Lehrer & Woolfolk, 1987) noted frequent discrepant findings among the behavioral, cognitive, and somatic measures of anxiety. It appears that these three dimensions, though they do at times vary together, often do not. The "specific effects" hypothesis states that a given treatment in one of the above modalities would specifically affect the dimension of anxiety in that given domain. Therefore, a relaxation technique would be expected to decrease somatic dimensions of anxiety while a cognitive technique may decrease subjective reports of anxiety. This type of interpretation of matching technique to problem area is consistent with what Lazarus (1973) has suggested. Benson (1975) has argued for a single "relaxation response" which is opposite to the specific effects hypothesis since implementation of relaxation techniques would result in a unified reduction in anxiety via this general response. Schwartz, Davidson and Goleman (1978) hypothesize that both accounts may operate, that specific effects are "superimposed" upon a general relaxation response.

Lehrer and Woolfolk (1987) concluded from their literature review that some techniques do have specific effects but that they are occurring in conjunction with a generalized relaxation response which supports the Schwartz et al. (1978) hypothesis. There is evidence of decreases in global symptomatology after the use of stress reduction techniques but the greater effects appear to occur more

specifically in muscular-skeletal reductions of tension after the specific cue of biofeedback or progressive relaxation compared to autogenic (suggestive) feedback therapy. Also, cognitive therapies do tend to do better than relaxation therapies in the domains one would expect such reductions (e.g. test anxiety, insomnia, depression, anger, phobias, and perceived anxiety.) There is also reason to believe that cognitive therapies can be successful in treating tension headaches. The authors also state that a combination of cumulative effects rather than one technique, especially if the cumulative techniques are not administered in a superficial manner, result in greater benefit than the administration of one technique alone.

In the worksite stress management program evaluation literature studies have reported outcomes based upon general efficacy without explicitly testing the assumptions outlined above. The review below attempts to examine worksite stress management evaluations in a manner that allows one to view how the assumptions of specificity and/or a generalized relaxation response are being tested in worksite programs. The present goal in this area is to go beyond the often referred to "prepackage" claim of a successful program without empirical basis to a type of stress program that is constructed with empirically verifiable components based upon sound conceptualizations.

Worksite Stress Management Evaluation Studies

Four reviews of evaluation studies of worksite Stress Programs have been published (Peletier & Lutz, 1988; McLeroy, Green, Mullen, & Foshee, 1984; Murphy, 1984; Chen, 1984). The McLeroy et al. (1984) study is the most comprehensive methodological review. In general, most studies have found that stress management interventions are better than wait-list controls. However, in the more controlled studies recent debate concerning the role of nonspecific treatment effects clouds interpretation of the outcome studies. In addition, though treatment outcome is usually positive, effects tend to diminish over time.

McLeroy et al. (1984) noted that, "Outcomes appear to be unrelated to the type of stress reduction program that is used, or to the program format." (McLeroy et al., 1984; p. 389). It is difficult to understand why this may be the case. Given the specificity hypothesis, one would expect that specific effects would be found in areas that are related to the program content. Testing the specific effects hypothesis is comparable to asking a straightforward construct validation question. Does the domain thought to be related to the observable area of intervention change due to the intervention? More specifically, does relaxation exercises decrease muscle tension? Does changing cognitions change cognitive self statements related to self reports of anxiety? Does changing maladaptive behaviors in interpersonal

interactions decrease social anxiety? On the other hand, do interventions produce a generalized relaxation response that affect differing areas of anxiety? Or, could nonspecific treatment effects be accountable for apparent changes regardless of program content?

In the following review I will be presenting the type of specific program content utilized (independent variable) and the reduction in the symptomatic domains involving psychological (cognitive, affective, and behavioral), and physical outcome variables (SBP, DBP, forehead EMG, etc.). The following review includes the studies reviewed by McLeroy et al. (1984) as well as more recent evaluation studies. Stress management programs have been reported to have an apparent positive effect, however the component of nonspecific treatment effects is still a factor to contend with. By presenting the material in this fashion, it is hoped that more evaluation studies will measure different levels of functioning in an attempt to examine the effects of differing independent variables on psychological and physiological process and outcome measures. By testing more directly the specificity of the intervention or the "general relaxation response", we may better understand the effects of our interventions on differing levels of functioning apart from nonspecific treatment effects.

Pre-Experimental Studies

All pre-experimental studies published to date report a positive effect on psychological and physiological variables. Manuso (1983) conducted an evaluation on both an individual and group format worksite stress management program. Individualized biofeedback was shown to decrease somatic symptoms of forehead-muscle tension and produced a reduction of symptom interference on a behavioral level, that of job functioning as well as in health behavior. Therefore, individualized biofeedback influenced somatic and behavioral outcome variables. Manuso also reported a reduction of medication-taking behavior (Manuso, 1983). In a group format program involving stress inoculation techniques, relaxation techniques, and cognitive restructuring Manuso (1983) reported a reduction in health care seeking behavior and subjective reports of stress symptoms decreased. The individualized program focused primarily on individualized relaxation training which influenced the somatic and behavioral level suggesting some generalization of response when reducing somatic tension. In the group format using more cognitive-behavioral instructions, subjective reports of symptoms were decreased and behavioral change occurred as well. Manuso's work supports behavioral change when one uses both an individualized and group format. A generalized response occurred using biofeedback with resulting change on the behavioral level. Cognitive techniques and stress inoculation

technique in a group format also produced change on the behavioral level and subjective reports of stress decreased.

In a pre-experimental study by Bowers (1983) progressive relaxation, time management, cognitive restructuring and assertiveness training were taught in a lecture/discussion format. One could characterize this program format as an educational/supportive one. Participants perceived reduced tension levels and improvement in health related behaviors. It is not clear what component, perhaps all, caused the stated changes, however, participants did report changes that would be expected given the intervention. According to this study, education and support can produce stated changes in behavior.

Stenmetz, Kaplan, and Miller (1982) taught relaxation techniques, cognitive restructuring, and assertion training. They found a reduction in emotional stress symptoms such as frustration, feelings of powerlessness, anger, worry, and impatience suggesting that a cognitive-behavioral intervention is effective in reducing reports of negative affect associated with the subjective report of feeling stressed. It is not clear if all components interacted to produce changes in affect and subjective reports or if one component, such as cognitive restructuring, had a more direct impact.

Scheingarten (1981) (cited in McLeroy et al.; 1984) reported that a 3 day stress management intervention can reduce blood pressure in company executives. However, there were few participants (n=8) so interpretation of such a result

is only suggestive. In another pre-experimental study, Abbamonte et al. (1979) instructed 6 police officers in biofeedback and passive relaxation training and found a reduction in muscle tension in 5 of them. Blood pressure change did not last for more than one month. The Abbamonte, Matheny, & Deivanayagam (1979) study suggests that three physical parameters -- blood pressure, hand temperature, and muscle tension -- can be influenced by relaxation methods which would be predicted by the specificity hypothesis.

In summary, preexperimental studies have found changes in physiological parameters when somatic interventions are used. This supports a specificity hypothesis. The Manuso (183) study lends support to the generalized response assumption, Manuso reported changes on both somatic measures and behavioral measures. Educational interventions may change subjective reports and health related behavior and cognitive-behavioral skill training coupled with relaxation was shown to decrease negative affect associated with perceptions of stress. Cognitive interventions were shown to impact both cognitive and behavioral levels of functioning.

Quasi-Experimental Studies

All quasi-experimental studies also have found positive psychological or physical effects due to stress management programs. Gray-Toft (1980), unlike many investigators, used a semi-structured intervention involving group discussions

with a major emphasis upon insight-oriented intervention. The group discussions involved actual stressful incidents occurring on the job related to the care of terminally ill patients. The nurses were also taught coping skills, relaxation skills, conflict resolution, and communication skills. Therefore, program content involved 1) insight through discussion of common stressors and 2) individual skill building. The program appeared to produce changes in self-reported stress, work load, and stress associated with death and dying, also, reduction in staff turnover was noted. The insight oriented group discussions may be more effective in addressing common incidents shared by individuals. These common incidents may be based upon the nature of the job. This is a different type of intervention compared to one which focuses primarily on individual skill building without attention to commonly recognized job stressors inherent with job design. Social support appears to be an active ingredient in the insight oriented program conducted by Gray-Toft. Because of this, it is difficult to separate out the effect due to social support as a possible nonspecific treatment effect.

In a study by Forman (1981) teachers identified and discussed five factors of relevant concern to them: time, role, physical, social, and tasks factors. The program implemented training in relaxation; cognitive restructuring; (Ellis' ABC model and irrational beliefs reviewed); rehearsal

(imagery and roleplay); as well as an application phase. The program employed cognitive, behavioral and somatic skill interventions. The author found that self-reported anxiety was reduced and evaluation of work environment improved in areas of work, supervision and co-workers. However, anxiety levels increased for the control group which may augment the differences between the groups on some factor(s) not due to the intervention. The intervention, which included a strong cognitive-behavioral component and an application component, did appear to decrease perceived anxiety and had a positive influence on the interpersonal level of functioning. Like the Gray-Toft (1980) study, the introduction of relevant situational stressors into the program (application phase) had some effect in self-reported stress. In these studies individuals were given concrete and relevant situations whereby problem solving, either in the form of insight-oriented group discussion of the individual's reaction (Gray-Toft, 1980) or use of a more structured ABC problem solving model (Forman, 1981) may aid in reduction of situational anxiety involving cognitive perceptions of anxiety. Therefore, cognitive-behavioral or insight group oriented interventions may prove effective in decreasing perceptions of role-related job stress.

In a study by Seamonds (1982) subjects were screened for "at risk" status on a stress inventory and given referral and educational information from a one time interview. This study

is quite different from the more long-term group oriented programs since it evaluates the effectiveness of a one-time intervention. This type of intervention would be expected to produce change on the behavioral level, specifically health seeking behavior. Seamonds (1983) found a significant decrease in absenteeism at 6 months. Eighty-nine percent of those interviewed were given referrals. A follow-up study conducted 6 weeks after the initial interview revealed that seventy-six percent stated they gave health care a higher priority after the interview, eighty-eight percent would recommend the interview to others and seventy-five percent reported moderate to high success in improvement in their coping skills. This latter finding may reflect the difficulty with obtaining only subjective measures in evaluation studies. On the basis of a 20 minute interview such reported improvement seems to be questionable since one could argue that changes in coping skills involving actual implementation of coping knowledge would require more time investment. In addition, no control group was involved in the follow-up. The study does suggest participants increased their awareness of health matters based upon the individualized program contact.

Experimental Studies

Drazen, Nevid, Nicholas, and O'Brien (1982) evaluated the effect of four separate stress management conditions on blood pressure. Subjects were recruited through blood pressure

screening. All subjects had blood pressure in the mild hypertension range and none were taking anti-hypertensive medication or following any protocol to reduce blood pressure. The study evaluated the effect of changing cognitions related to anger situations in 2 conditions, the first dealt with self-regulation of anger responses, the second dealt with anger responses within interpersonal situations. The third condition was designed to change cognitions as they relate to subjective perception of anxiety. The first two experimental conditions used cognitive techniques (rational-emotive therapy and assertiveness training) the third experimental condition taught cognitive discrimination skills toward internal cues of bodily tension (anxiety management training). The rational-emotive (RET) condition focused on the Ellis ABC model in situations where anger is the activating event. Assertiveness Techniques (behavioral rehearsal and role playing) were used to provide examples of interpersonal relating, especially as it involved anger. Anxiety management training (AMT) taught participants how to discriminate internal cues of anxiety and to than employ an anxiety reducing technique (imaginal rehearsal and progressive muscle relaxation and calming mental imagery). Hypertension education counseling (HEC) provided a control for nonspecific effects (no training in behavioral techniques provided). The Rational-emotive therapy and Assertiveness Technique groups recorded cognition on standard rational emotive homework

sheets for later discussion in group meetings. Practice of cue-controlled relaxation on a routine daily basis occurred in the Anxiety Management Training group.

This is the only experimental study which directly examines the influence of changing cognitions on blood pressure. However, blood pressure was not appropriately controlled for given the plausible reduction in salt intake in the Health Education Counseling group. Therefore, any changes in blood pressure due to cognitive or behavioral functioning relative to nonintervention is not clear. An analysis of covariance (using pretreatment blood pressure) revealed no significant differences on post and follow-up blood pressures. The authors interpreted the within group reductions as perhaps due to non-specific treatment effects. The within group reductions in the rational-emotive group were maintained at a 2 month follow-up. Unfortunately, no information was obtained on possible changes in cognition or assertive behavior. The Drazen (1982) study does not clearly support a change on the physiological variable of blood pressure due to psychological intervention when measured at pre and post intervention intervals. However, a within group reduction in blood pressure within the Rational-emotive group is worth noting. Further research comparing psychological intervention with a comparison group not active in any specific treatment may be helpful in isolating effects.

However, another study does document change in blood

pressure due to psychological intervention. Charlesworth, Williams, and Baer (1984) instructed an experimental group of hypertensive individuals in progressive and differential relaxation, autogenic training, visual imagery, cognitive restructuring, and assertiveness training. There was no behavioral contracting but informal verification of behavioral activity was completed; spouses and friends of participants were asked to fill out forms on whether they observed the participant carrying out activities from the program. Subjects were given relaxation tapes to aid in home practice. Both SBP and DBP were significantly reduced from a baseline period to the end of the 10 week period. A control group showed no significant SBP and DBP reduction over a comparable time period. When the control group was given stress management training the resulting SBP and DBP reductions were significant. When blood pressure was recorded 3 years later, there were significant reductions for both SBP and DBP. Thirty percent of the subjects who had a medication regimen responded with a reduction in blood pressures that was judged to be clinically significant. The frequency of relaxation practice and the amount of blood pressure reduction achieved during relaxation practice were significantly correlated with blood pressure reduction after the stress management program. The stress management program lowered health care costs and increased health supportive behavior.

The only experimental study examining decreases in blood

pressure in predominately normotensive subjects was Peters, Benson, and Peters (1977). One group employed a specific relaxation exercise. The second group was told to relax but to not employ a specific relaxation exercise. Participants were asked to do two 15 minute relaxation breaks, one in the morning and one in the afternoon/evening. There was a control for desirability to be involved (non-volunteers) as well as a wait-list volunteer control group. SBP and DBP was significantly reduced in the Respiratory One meditation group. Therefore, it appears that reduction of blood pressure is possible in both hypertensive and normotensive employees.

Sarason (1979) implemented progressive relaxation, role-playing, modeling, and self-monitoring of responses using cues during stressful situations. A comparison was made of the performance on mock police trainee trials of anxiety situations between a stress management group and a control group. The mock police trials were part of a police trainee program. The largest difference on observer rating measures occurred for a mock scene that was similar to one used in the stress management program. The experimental subjects did not score as highly on other mock scenes which were only peripherally related to stress program content. The authors explained that the large difference in ratings for the mock scene related to program content was due to the specificity of the situation. They conclude that "...stress management programs may be most effective when they focus on specific

situations likely to be encountered by subjects. To maximize their effects it may be necessary to emphasize to a greater degree than was done in the present study how the coping skills presented as part of the program may be applicable to a broad range of specific situations." (Sarason, 1979; p. 601). Overall, the stress participants scored higher on observer ratings of overall level of performance, ability to follow police protocol, and desirability to have the trainee be a partner with the observer rater in a real life situation. On the other hand, self report measures indicated the experimental group reported greater levels of anxiety and anger. The authors interpreted this greater report of anxiety and anger in the experimental group as a result of becoming more aware of their emotional responses thereby rating them higher at post test. Increases in measures of perceived anxiety may result from program participation in conjunction with better performance in specific situations as a result of participation in a stress management program. Like the quasi-experimental studies of Gray-Toft (1980) and Forman (1981), situation-specific events that are involved in an application phase may be key components in stress management programs. It should be noted that no differences were found on any of the physiological measures of blood pressure or heart rate in pre to post measures.

Ganster, Mayes, Sime and Tharp (1982) reported reductions in epinephrine levels in a group of employees who were given

four sessions of rational-emotive instruction and four sessions of progressive muscle relaxation to compliment the cognitive intervention. They found a significant reduction in epinephrine levels and depression in the treatment group compared to controls. This study attempted to integrate cognitive appraisal with a relaxation response through two widely accepted models of intervention. Perhaps the treatment was deemed effective because the intervention focused primarily on these two techniques rather than introducing more techniques than could be mastered in an 8 week period.

Murphy (1983) found that individuals trained in biofeedback reported larger increases in work energy levels at follow-up while a progressive muscle-relaxation group reported greater ability to cope with stress at follow-up. Biofeedback appeared to enhanced peripheral vascular relaxation and created an increase in work energy levels. Progressive muscle relaxation produced reductions in forehead EMG levels and increased positive reports of coping with stress. Murphy's (1983) study suggests that progressive relaxation may be a more effective way for the individual to help cope specifically with stress while biofeedback has a more global effect increasing perceived energy levels.

Carrington, Collings, Benson, Robinson, Wood, Lehrer, Woolfolk, and Cole (1980) predicted that symptomatology would be reduced due to relaxation interventions that could be performed during in vivo stressors. They used progressive

relaxation (PMR) and the respiratory one method (ROM) where mental repetition of the word "one" (or another preferred word) is linked with each exhalation of air. Clinically standardized meditation (CSM) was the third treatment condition where mental repetition of a sound selected from a list of sounds (or self-created) is allowed to proceed at its own pace and is not systematically linked with breathing. Cognitive focus is directed to mental stimuli only. Subjects learned their techniques in their own homes and were instructed to practice them twice daily for sessions lasting 15-20 minutes over a 5.5 month period. A wait-list group served as a control. Subjects were taught how to do "mini meditations" when dealing with in vivo stressors.

The clinically standardized meditation and respiratory one method groups reflected significant reductions in symptoms as measured by the SCL-90 compared to controls. They also found a difference between the meditation groups and the muscle relaxation group on a measure of intensity of perceived stress and a measure of the perceived "spread" of distress as well as lowered scores on the clinical subscales of depression, hostility, phobic anxiety, and psychosis. The progressive muscle relaxation group only improved on the subscale of hostility. The authors suggest that the progressive relaxation group may have reduced arousal if more extensive training took place. The authors believed that in order for progressive relaxation to be effective in decreasing

autonomic arousal it would require a longer training period, by contrast, the meditative techniques appear to decrease arousal under briefer training periods. The meditation groups had a 78% compliance rate at 5.5 months with treatment effect seen whether subjects practiced their techniques frequently or occasionally. Apparently, occasional use of meditative exercises can produce changes in perceived intensity and breadth of distress as well as within psychological domains involving both somatic and nonsomatic symptoms supporting the hypothesis of a general relaxation response.

Peters, Benson, and Porter (1977) employed the respiratory one method which was used in the Carrington et al. (1980) study cited above. A second group was told to relax but to not employ a specific relaxation exercise. Participants were asked to do two 15 minute relaxation breaks, one in the morning and one in the afternoon/evening. The other two groups served as controls for nonspecific treatment effects such as desirability to be involved in the program (non-volunteers) as well as a volunteer wait-list control group. Those who practiced meditation reported greater decreased symptomatology, illness days, improved performance, and greater sociability-satisfaction. Somatic symptoms and performance measures responded with less practice of the relaxation response than did behavioral symptoms and measures of wellbeing. While less than three practice periods per week produced little change on any index, two daily sessions

appeared to be more practice than was necessary for many individuals to achieve positive results. It appears that using the respiratory one method three times a week is effective in reducing symptomatology based upon the Peters, Benson, & Porter (1977) and the Carrington et al. (1980) studies.

Peters, Benson, and Porter (1977) found that practice rates during the follow-up period were higher for those who expressed more noticeable benefits but even those who stopped practicing regularly maintained some benefits over time. Carrington et al. (1980) found differences between those who practice and those who stopped on some outcome measures. They stated that frequent practice was not necessary to obtain symptom reduction and that frequency of practice did not predict stress reduction. It is unclear how post-training practice rates benefit participants.

Perhaps what is needed for relevant change to occur on the behavioral and wellbeing measures is not necessarily a quantitative change (more frequent practice with hopes of generalizing the relaxation response to these other areas of psychological functioning) but for one to evaluate the effects of qualitatively different interventions in these areas. One could compare whether attempts to generalize one relaxation technique to these other domains fare better than use of qualitatively different techniques (ie: problem solving, time management, assertiveness) in these same areas. Relaxation

may change somatic complaints and symptomatology while a specific behavioral techniques (i.e. assertiveness or cognitive restructuring techniques) may have a more specific effect on the behavior and psychological wellbeing measures. Again, what type of effects do these intervention have and what are the limitations of various techniques and subsequent claims of efficacy? Are there specific effects -- or is there one generalizable response across different domains?

Aderman and Tecklenburg (1983) conducted a study consisting of one lecture to participants about the effects of stress and taught relaxation skills to a group. After the lecture, participants were expected to practice relaxation techniques 15-20 minutes two times a day for three months. The techniques practiced were deep muscle and cue-response relaxation. The study predicted that the intervention would significantly enhance positive perceptions of the organizational climate and that relaxation training would significantly increase the personality constructs of internal locus of control and self-actualization. Also, debilitative anxiety was predicted to decrease, though "debilitative anxiety" was not clearly defined. These hypotheses suggest that relaxation training will have a clinically significant effect on a cognitive level. Aderman and Tecklenburg (1983) try to provide support for Benson's hypothesis of a generalized relaxation response. The assumption behind the study is that practicing the technique of relaxation is

thought to influence anxiety in other levels of functioning. The impact of a specific technique is "generalized" to those levels. The study reports a decrease in debilitative anxiety and increases in personality characteristics (internal locus of control and self-actualization) thought to be related to personal adjustment. The authors attribute the lack of significant results in changing an individual's perception of their organizations as being due to the amount of time they spend relaxing. They cite another study by Frew, (1974) (cited in Aderman & Tecklenburg; 1983) which found that individuals who practiced relaxation had higher levels of both organizational and job satisfaction, however, "S's had practiced relaxation for over a year and a half". The authors go on to recommend exploring different lengths of relaxation training rather than attending to cognitive distortions of the organization or another possibility, realistic perceptions of inherent stress in poor design and organizational management. Again, perhaps a qualitatively different intervention such as cognitive-behavioral skill training (cognitive restructuring or assertiveness) would create changes in organizational perceptions rather than the need to increase the amount of relaxation practice.

According to Kazdin, (1980) nonspecific effects need to be controlled in order to attribute differences on the parameters of interest to treatment effects. Peters, Benson, and Porter (1977), and Sallis et al. (1987) provided a control

for such effects and raised the question of how effective stress management techniques are, as presented in worksite programs, if nonspecific treatment effects may be producing the noted variance in studies done to date. Effects due to desire to participate in the program or simply taking time each day to relax are among the most noted nonspecific treatment effects.

Comparisons of different stress program administrations have largely been unexplored until the work of Sallis et al. (1987). This study compared three conditions while controlling for non-specific treatment effects. The first condition was a single component relaxation training, the second condition was a multicomponent cognitive-behavioral program emphasizing relaxation training, cognitive skills and behavioral skills (assertiveness). Condition 3 consisted of an Education/Support comparison condition controlling for nonspecific treatment effects and the value of social support in stress reduction. The authors also conducted an internal validity check by assessing whether the participants found the intervention to be consistent with the authors' claim. The credibility of the interventions was reflected by the participants' responses. A monetary incentive program also rewarded subjects for attendance. The major difference between the multi-component and the educational control was that there was no attempt to teach specific skills in the control group.

There was a significant reduction in anxiety, depression, and hostility which was maintained in all conditions. No group improved significantly on job satisfaction, work stress, resting blood pressure, or blood pressure reactivity to mental arithmetic or cold pressor stressors. Therefore, the intervention did not influence both work-related and physiological measures. There was no evidence that one group was more effective than the others on any of the outcome variables. The authors therefore concluded that psychological benefits may have been due to nonspecific treatment effects such as group support and leader attention. Nonspecific treatment effects appeared to be influencing subjective reports of reductions in anxiety, hostility, and depression since group leaders were implementing different component interventions, however, similar results were obtained.

The findings of Sallis et al. (1987) and Drazen (1982) call into question the value of stress management programs to lower the blood pressure of stress participants based upon the premise that stress related interventions may be able to slow the age-related rise in blood pressure found in the general population. Sallis et al. (1987) concluded from their study that nonspecific treatment effects were responsible for noted decreases in all groups -- both education and skills training groups. Charlesworth et al. (1984) and Peters, Benson, and Peters (1977) on the other hand, suggest that blood pressure can be reduced using a multi-component

intervention and a meditation technique. It is not clear that nonspecific treatment effects may account for psychological changes as Sallis et al. (1987) suggest. In a component analysis study of stress inoculation, West, Horam, and Games (1984) call into question the interpretation that changes in worksite programs are due to non-specific effects alone. The study isolated four treatment conditions thought to be related to specific sub-components of stress inoculation interventions: Education alone (ED); Education plus teaching of coping skills (CS = assertiveness, time management, cognitive restructuring, and relaxation); and Exposure (EX = Education plus role play based upon relevant stressors in nursing occupation).

In the Sallis et al. study (1987) the Education/Support group was thought to be different from the Multi-component group in that the former group was not directly taught coping skills. The West et al. (1984) study offers a component analysis that challenges the Sallis et al. (1987) interpretation. West et al. (1984) based their intervention upon a paradigm forwarded by Meichenbaum and Cameron (1983) that emphasize the importance of exposure in addition to education and skill building. All components involved education since education is a prerequisite to carrying out coping skills and exposure to stress events. If treatment intervention is equivocal across all intervention domains due to nonrelevant treatment events than one would expect no

notable changes in any of the above conditions.

Like the Sallis et al. study (1987) an analysis was performed to check the credibility of the program presentations. The authors found that the experimental and control subjects did not perceive a difference in the credibility of treatments. The study found that the coping skills component constituted the major active ingredient of the stress inoculation paradigm as described by Meichenbaum and Cameron (1983). The authors noted that one might argue greater contact time with the leaders would be a significant non-specific treatment effect which would skew the results. However, if this were the case, the Stress Inoculation component which included Education + Coping Skills + Exposure would have fared better than all others. The results do not suggest that differential leader contact had a major influence since the actual outcome found the Coping Skills component to be equivalent to the Stress Inoculation component. This implies that the treatment with less contact time, Coping Skills, is just as effective as a treatment which included exposure to events. The Exposure component alone, the education component alone, and the no treatment control did not result in significant effects. The authors suggest that informal exposure over the course of 5 weeks in all the conditions might have outweighed any benefits derived from the Exposure component alone. The authors concluded that Coping Skills appears to be the most active ingredient and no placebo

effect could adequately explain the positive results found in the component analysis of this specific factor contrary to prior studies that have attributed effects to nonspecific treatment effects.

In a study by Jackson (1983), an intervention was designed to increase the frequency of staff meetings and focus was placed upon granting employees a greater consultative role in decision making. The format typically stressed organizational decision making rather than an instructional or motivational emphasis on the individual level. The impact of the intervention at the employee-environmental level decreased role ambiguity and role conflict, two relevant stressors in the relationship between the employee and environment. The Jackson study is by far the most sophisticated statistical investigation to date using casual modeling to investigate the relationships between emotional strain, social support, job satisfaction, absenteeism, role conflict, job-related communications, personal communications, and perceived influence and the effect that participation in decision making has on these preceding variables. The study proves that participation in decision making can decrease role conflict and ambiguity. The results of such a study suggest that objective organizational practices, such as decision making, can have a causal influence on employees at the individual level on such individual variables as job satisfaction, job strain, absence, and turnover intention.

The evaluation literature suggests that coping skills may be the most important component in stress inoculation approaches. There is less direct evidence that an application phase is as important as instruction of coping skills given that a controlled component analysis study did not find strong support for this. However, lack of control for informal application of skills by comparison groups may account for this. Therefore, it remains inconclusive whether an application phase is helpful or not. Three other studies, one experimental and two quasi-experimental, indirectly suggest that an application phase aids intervention effectiveness (Sarason et al. 1979; Gray-Toft, 1980; Forman, 1981). Therefore, exposure to actual or simulated stressful events and use of roleplay or application of skills relevant to the situation may help decrease self-reports of stress. Meditation instruction is more readily utilized by individuals to decrease self-report of stress and somatic complaints than use of progressive relaxation strategies, even if such strategies are taught in an abbreviated form. This is not to suggest that progressive relaxation is not useful, but merely that briefer amounts of time are needed for one to see effects if meditation is used, in particular the respiratory one method. However, if one does not teach progressive relaxation, one may not be instructing the subject to recognize internal stress cues which may influence the subjects long-term in vivo responses, even though learning

such cues may take time. Controlled studies have documented that effectiveness of treatment can occur if frequency of meditative practice ranges between 1 to 3 times per week. "Occasional" practice can be effective, one time per week or less at the lower end (Carrington, et al., 1980) to approximately three times a week at the higher end (Peters, Benson, & Porter, 1977). More than three times per week does not appear to change symptomatology significantly (Peters, Benson, & Porter, 1977). Studies examining reductions in blood pressure are in conflict. Less controlled studies suggest a benefit in reducing blood pressure, however, in more controlled studies, two have shown some significant reductions while two others found no reductions.

The Specificity and Generalized Relaxation Response Hypotheses Revisited

To aid in conceptualizing the relationship between worksite stress program evaluation literature and theoretical knowledge of the stress process, I will again relate program orientations to the two basic assumptions outlined in the comparative stress reduction literature outlined earlier.

In the studies mentioned above nearly 80% use some form of relaxation technique, most studies have a combination of relaxation technique with other techniques. About 40% taught cognitive skills training in some manner, and only 16% dealt with techniques which could be considered as methods to reduce

stress in one's life rather than only manage it. Charlesworth et al. (1984) have argued that relaxation training should be the major ingredient of worksite stress programs. Relaxation is the most frequent intervention of choice, perhaps because of the obvious benefit of directly reducing somatic complaints of anxiety and the feasibility and logistic ease of instructing relaxation techniques in the worksite. However, it is still unclear whether relaxation alone or whether a combination of relaxation with other techniques would be the optimal intervention of choice. Heuristically, the worksite stress management literature could be divided into two basic programmatic forms of presentation. These two basic presentations of theoretical knowledge are based upon two underlying assumptions. One is based upon the assumption of a generalizable relaxation response which is thought to decrease anxiety across differing domains of functioning by teaching a relaxation technique. The relaxation response is thought to be an integrative hypothalamic reaction involving decreases in sympathetic activity (Peter, Benson, and Peters, 1977). In these types of interventions the presumed threat that is thought to precede the stress response is irrelevant to implementing the intervention since the sole objective is simply to decrease autonomic arousal by providing some form of response which counteracts physiological arousal. This counter-response may include meditation, muscular relaxation or various breathing techniques. A second approach toward

worksite stress management programs would include acknowledgment of perceived threat either explicitly or implicitly in the intervention. Such techniques included stress inoculation, cognitive restructuring, assertiveness, time management skills and other cognitive-behavioral techniques. To a further degree it also involves organizational development strategies that function to decrease effects of stress upon individuals through organizational design. Perceived threat that originates from the organizational structure may present a whole class of threats that are experienced by all individuals in the organization.

The stress response may be readily influenced by relaxation skills. However, relaxing somatic tension appears to be only one intervention point within the larger stress process. The process of response is due, presumably, to some type of perceived threat. This threat could be anything, threat to self esteem, threat of demotion, threat of humilation, threat to physical life, etc. If Mason's interpretation of the concept of nonspecificity is accurate, nonspecificity being defined as the affective response to stressful stimuli, than we must explore the differing ways to intervene given the argument made by Lazarus that the stimulus is not just any stimulus, but one that across all situations has the common component of threat. Such psychological intervention would include the direct acknowledgement of both

perceived threat and affect in the stress response and therefore stress interventions would need to address how one mediates affect. It is here that various programs emphasize differing points of intervention. They may tend to emphasize intervention directly on the somatic arousal level or more directly on the cognitive-affective level.

Mediation of affect and mediation of arousal may be viewed as two different types of interventions. This dichotomy is not intended to classify nor simplify all stress interventions, but heuristically it may be a useful distinction to make when viewing the worksite stress literature and measuring differing levels of intervention effects while trying to understand the stress-disease process. Relaxation focused interventions attempts to teach the individual methods of arousal reduction. Psychological interventions that actually try to change cognition relevant to threatening stimuli intervene to mediate affect. Instructing one in relaxation may decrease somatic tension via mediation of generalized arousal when one becomes aware of internal autosensory cues. Intervention to mediate affect relies upon direct acknowledgement of cognitions that are involved in perceptions of threat. It becomes important to identify the actual source of threat in order to mediate cognition, and, consequently, the affective stress response.

The hypothesis proposed by Schwartz, Davidson and Goleman (cited in Lehrer and Woolfolk, 1987) in the comparative

literature of stress techniques suggest that a specific effect is superimposed upon a generalized relaxation response. In order to study this same hypothesis in worksite programs, one would need to separate out the generalized response across all domains (all domains being somatic, cognitive, affective, and behavioral) thereby testing the generalized relaxation response. One may also compare relaxation techniques alone to cognitive-behavioral techniques involving perceived threat which would involve mediating specific stress responses via cognition (again measuring all domains to assess specific effects).

Component analysis studies could compare the changes on the predicted general arousal levels given relaxation alone with changes in specific threat events mediated by cognition effecting affective stress responses. From such studies we may be able to find delimiters in the effectiveness of relaxation techniques when taught in isolation of specific interventions rather than assuming that relaxation alone is the optimal intervention when in fact it may be only optimal when it is used in combination with intervention which reduces threat.

When the two are combined, one would predict a specific reduction in cognitive-affective threat reactions superimposed upon a general relaxation response. If in fact there is a superimposed response upon a more generalizable relaxation response, which the comparative literature on stress

techniques suggests, we may than expect that our intervention would be optimal if they included reduction of general arousal (general relaxation) and reduction of cognitive-affective related arousal involving perceived threat (specificity hypotheses operating on the cognitive-affective level). If it can be shown that the superimposed hypothesis is accurate, the rationale for why it may be more effective may be due to manipulation of both a general arousal response and specific threat-related affective responses which use cognitive processes to integrate the response system to stress related events. One then has the means to both respond to immediate frustration of goals and the ability to provide alternatives to frustration of goals via cognitive appraisal processes. In other words, reduction in generalizable arousal may not be equivalent to reducing the stress response in other domains of functioning and it is possible to predict what levels one technique may be more effective in compared to others. We can design evaluation studies in a manner that takes the "superimposed" hypothesis into consideration.

In addition, further evaluations of stress reduction programs can aid our understanding of the general pathogenic processes involved in the stress-disease process. General efficacy information could be collected in combination with process measures in order to identify important process variables that may be related to pathophysiological stress responses. We already have access to physiological process

measures that are predictive of later cardiovascular disease (blood pressure) but we lack understanding of the important psychological process variables that may exist concomitant with these physiological predictors. Some evaluation studies have shown a decrease in affective states such as hostility (Carrington et al., 1980; Sallis et al., 1987) and other negative affective states (Steinmetz, et al. 1982).

The cognitive system is assumed to be involved with influencing the presence or absence of affect, which appears to be involved with the adrenal-medullary-cortical axis. This axis, in turn, is related to secretions of adrenal cortisone which affects blood pressure. Ambulatory blood pressure has prognostic value for predicting later cardiovascular events (Perloff, Sokolow, and Cowan 1983). To fully understand the stress process and be able to effectively intervene over time, we may need a greater understanding of threat appraisal processes in the worksite rather than simply teaching immediate measures of arousal reduction. What may be more effective and produce lasting change is implementation of appropriate motivational knowledge to maintain behavioral changes in basic domains of cognitive and behavioral functioning in conjunction with immediate measures to reduce arousal. This may result in a specific effect superimposed upon a generalized relaxation response promoting optimal change in worksite stress management programs.

The Current Evaluation Study

The purpose of this study is to use ambulatory monitoring in an attempt to explore the generalizability of effects of a worksite multicomponent stress management intervention. Three physiological measures will be used. SBP and DBP and HR are indirect measures of sympathetic activity and are thought to be less amenable to subjective influences which contribute to nonspecific treatment effects. In addition, three psychological process variables will be examined while blood pressure is measured: reports of frustration, reports of stress, and subjective report of accomplishing things. Measures will include worksite and home observations.

Physiological measures appear to be less influenced by nonspecific treatment effects and are of theoretical interest in understanding the interplay between psychological processing and physiological arousal. How one measures such variables is critical. This is particulary true with regard to blood pressure which has traditionally been a parameter reflecting vast variation across even relatively small amounts of time, such as a single day. Therefore, the next chapter discusses relevant measurement issues involving the use of ambulatory blood pressure monitoring. This technology has never been used to evaluate stress management interventions within the worksite. This study is exploratory in nature. It is hoped that this technology may allow us to examine the ability of individual's to generalize relevant psychological

skills, which may mediate affect and arousal, into their daily lives.

Differences Between Casual (Office) and Ambulatory Blood Pressure Measurements

Studies, in general, have found that blood pressure taken in the physician's office has a correlate of approximately .60 with longer periods of blood pressure measurements (Thanonopavarn, Goldstein, Shapiro, Golub, & Sambhi, 1983). Ayman and Goldshine (1940) first noted a difference between blood pressure at home and at the physician's office in patients with essential hypertension. The variability in blood pressure during the day may cause this discrepancy. Also the stress of a clinic visit may also elevate pressure readings. Mancia et al. (1983) found that intra-arterial blood pressures (a more direct measure of blood pressure) rises during clinic measurements. Therefore, two factors are important to consider when observing measurements made either in or outside the clinic.

First, how many measurements are being taken outside of the clinic or lab? The greater number of measures made available through ambulatory monitoring would take into account a greater variability in actual blood pressure over the course of 24 hours. A mean calculation would be influenced by the greater number of observations during monitoring compared to casual or shorter periods of observations.

Secondly, does the clinic or lab situation produce a stress response that would normally not be found in measurements taken outside of that situation? Blood pressure may be influenced by the type of environment one is in. For example, Thananopavarn, Goldstein, Shapiro, Loub, and Sambhi (1983) evaluated the effect of relaxation, relaxation with biofeedback, and a control group (all groups were involved in conjunctive antihypertensive treatment) and found no significant differences between groups in lab readings. However, the relaxation and relaxation with biofeedback groups did show significant reductions in SBP and DBP measures while at home.

Reproducibility of Blood Pressures

Weber, Drayer and Wyle (1982) found that the most consistent parameter indicating stable reproducibility is the actual blood pressure level rather than its variability (correlation of variability) or blood pressure pattern throughout the day. In another study, one of the simplest indexes, yet an important one, is the highest and lowest blood pressure and the differences between them (the amplitude). Weber, Drayer, & Chard (1983) (cited in Fitzgerald et al., 1983) assessed the reliability and validity of blood pressure measures using amplitude of measurements. The authors found that within subject blood pressure amplitude correlated significantly with the full 24 hour blood pressure average,

it also correlated with casual and day time blood pressure readings. However, the correlation between SBP and nighttime readings is very weak. The authors interpret this as a function of greater variability in SBP during the waking hours. The DBP measures did not behave in a similar fashion when compared to the SBP measures. They did not correlate with any of the parameters that SBP correlated with. In contrast, the DBP measures were related solely with the nighttime readings. The correlation between nighttime DBP values and daytime DBP amplitude was negative, the lower the DBP values at night, the greater the amplitude during the day. The authors suggest that perhaps the SBP and DBP measures are influenced by different mediating factors depending on the time of day, though they admit this is speculation.

Ward and Hanson (1983) found an overall high level of reproducibility for SBP using ambulatory blood pressure monitoring during both rest and moderate levels of activity. For DBP a moderate level of accuracy was found for reproducibility during these same activities. Observations took place during two sequential days using standardized conditions (supine position and submaximum bicycle exercise). Falkner, Lowenthal, and Kushner (1983) studied the within subject reproducibility of blood pressure measures while studying the stress response to various stress tests. According to the authors, their results support the reliability of ambulatory monitors as subjects confront

various test stressors. The Ward and Hanson (1983) and Falkner et al. (1983) studies support the reproducibility of ambulatory measures under realistic conditions of restful to moderate physical activity and during various stressful situations.

Fitzgerald, O'Malley, and O'Brien (1983) conducted a study of the reproducibility of measures of variability in ambulatory blood pressure recordings. The three measures studied were the peak and trough means of all daily recordings, the standard deviation and the coefficient of variability. Until this study, most attempts to reproduce ambulatory measures were based upon a shorter period of one or two days. They studied the reproducibility of ambulatory blood pressure measurements over a 6 month period; subjects wore the monitor for three to seven days during the study. The authors did not find a significant decrease in ambulatory blood pressure during successive recordings in their study. Although in an earlier study by Kain et al. (1964) a noted decrease in blood pressure (fall of 5 mmHg) took place during the first 5 hours of monitoring. The Fitzgerald et al. (1983) study suggests that such drops are not significant and may appear to be more significant if one uses multiple paired comparisons. Fitzgerald et al. (1983) also note that when using the Oxford system of intra-arterial monitoring, a more direct measure of blood pressure, there was no mean difference in successive days which suggests that noted changes in

successive days of measurement are not significant and adjustment reactions appear to be minimal.

The Fitzgerald et al. (1983) study supports the use of peak, trough, and mean measures as reliable parameters between sessions. The same authors found that the reproducibility of blood pressure variability as measured by the standard deviation and the coefficient of variability occurred for a few patients, but by and large, were not reproducible for all others. Similar results suggesting a lack of reproducibility for these same measures were also found in the Weber, Drayer, and Wyle, (1982) (cited in Fitzgerald et al., 1983) study mentioned earlier. Because of these noted inconsistencies in reproducibility, Fitzgerald et al. (1983) have argued against using the coefficient of variability or the standard deviation as accurate measures of blood pressure variability.

Blood Pressure and Circadian Patterning

Blood pressure follows a circadian pattern. The actual mechanisms responsible for this fluctuation are not yet known. Decreases of blood pressure and heart rate occur at night and fall approximately 15% for all groups tested. Groups that have been studied include individuals with mild, moderate, and severe hypertension as well as normotensive individuals. The decrease in blood pressure and heart rate with sleep has also been observed using intra-arterial techniques (Mancia et al., 1983). As noted, blood pressure falls at night, and in

conjunction with this, variation in pressure tends to decrease as well (Raftery, 1983). There are two peaks during the circadian pattern. One in the morning around 10 a.m., the second in the afternoon around 1:00 p.m.. In late afternoon the mean blood pressure falls rapidly until 3 a.m., then begins to rise until 7 a.m.. From 7 a.m. to 10 a.m. there is a rapid rise until the first peak of the day at 11 a.m..

The pattern for heart rate is similar, heart rate tends to peak around 1 p.m. and from that point the mean heart rate falls continually. It starts rising again around 7 a.m. peaking at 10 a.m. It falls until 12 noon and rises rapidly to the daily peak at 1 p.m. (Raftery, 1983). Though there is a predictable pattern in blood pressure elevations, individuals who sleep during the day and work during the night do not show such patterning (Pickering, 1983).

Variation in Ambulatory Monitoring Due to Situational Stressors and Participant Adaptation

There has been a trend in the literature documenting the discrepancy between home and office blood pressures. Sixty-five percent of patients in a study by Fouad et al. (1983) had higher office blood pressures (up to 10 mm Hg higher than "normal" home blood pressures based upon weekly averages). This discrepancy has been interpreted to be due to anxiety, stress, fear and unfamiliarity with the medical surroundings (Page, 1977). However, some have debated this general

interpretation. Fouad et al. (1983) argue that there is no clinical sign which exists to support this hypothesis. These authors used heart rate as an indicator of "tension" and found no correlation between office heart rates and the discrepancy between home and office readings. Counter to this, Pickering has identified a "defense reaction" in subjects who wear the ambulatory monitor (Pickering, 1968, p. 37). He noted a rise in blood pressure in hypertensive individuals' casual blood pressure when they go to see the physician. He has named this rise in blood pressure during casual measures as a "defense reaction". Pickering did not report this rise in normal subjects, but he does note it in borderline and essential hypertensive subjects. It appears that over several visits the blood pressure tends to fall as the patient "adapts" to the situation of monitoring. Pickering and his colleagues have looked at the situational aspect of blood pressure fluctuation and examined how situational fluctuations during the work day may be related to cardiovascular problems (Pickering, 1968).

Predictive Validity and Prognostic Value of Ambulatory Monitoring

Level of blood pressure has been the most regarded prognostic sign of later cardiovascular target organ damage. Epidemiological studies and insurance mortality statistics have used both office blood pressures and home blood pressure

averages. Home blood pressures have been found to correlate higher with measures of left ventricular hypotrophy than office blood pressures (Ibrahim, Tarazi, Dustan, & Gifford, 1977). With regard to office blood pressure and ambulatory monitoring, a study by Perloff, Sokolow, Cowan (1983) found that ambulatory measures appear to be more accurate in predicting those individuals with target-organ damages, in particular, left ventricular hypertrophy, compared to physician office pressures.

It is believed that a sustained daytime elevation of blood pressure is an effective clinical indicator of later target organ damage when differentiating healthy individuals from those at risk. Therefore, it is believed to be more important to find out what the sustained pressure is rather than the office pressure since some individuals may have higher office pressure but not sustain this over the course of a day. Therefore, ambulatory monitoring technology is being called upon increasingly to aid physicians in diagnosis of hypertension as well as helping to evaluate treatment interventions.

Beyond this clinical application of ambulatory monitoring, research is currently underway to use such technology to examine the relationship between mood state and physical activity on blood pressure during a 24-hour period. The current study uses ambulatory monitoring as a method to evaluate the effects of a psychological intervention in the

worksite. A basic assumption of this study is that such an intervention may have an impact on psychological and physiological functioning while at work, home and during sleep.

HYPOTHESES

At Work

Hypothesis 1:

Program participants will decrease their SBP, DBP, and HR at work more than the nonparticipant comparison group.

Hypothesis 2:

Program participants will report less "Stress" and "Frustration" incidents and report "Achieving More" during work more than the nonparticipant comparison group.

At Home

Hypothesis 3:

Program participants will decrease their SBP, DBP, and HR at home more than the nonparticipant comparison group.

Hypothesis 4:

Program participants will report less "Stress" and "Frustration" incidents and "Achieving More" at home more than the nonparticipant comparison group.

During Sleep

Hypothesis 5:

Program participants will decrease their SBP, DBP, and HR during sleep more than the nonparticipant comparison group.

METHOD

Subjects

Subject Recruitment

Thirty-four subjects participated in this study (faculty, staff, and graduate students). Nearly all subjects' blood pressures were in the normotensive range. The nonparticipant comparison group was selected from a larger pool of subjects who were monitored during 2 work days one month apart. They were matched with the program participants on the variables of age, body mass, and sex. Table 1 contains relevant demographic information for all subjects.

The program participants were recruited from two academic buildings on the Michigan State University Campus. The Stress Management program was one of 4 programs offered to 2 separate buildings on the Michigan State University Campus as part of a Health Promotion effort. Participants were notified through flyers and campus mailboxes to attend a Health Fair which measured blood pressure, cholesterol level, and assessed each individual's health status as it related to a Cardiovascular Disease Risk Factor Estimate for referral to one of the four programs (weight and nutrition, stress management, exercise, and smoking cessation). Figure 1 reflects participation rates for the stress program and for ambulatory monitoring.

The recruitment process involved contacting those who showed an interest in a stress management program at the Health Fair, those who came to an initial orientation meeting

	SEX	AGE	WEIGHT
Stress Participants	8 females	$\bar{X}$=32 Range (24-44)	$\bar{X}$=136 lbs.
	9 males	$\bar{X}$=46 (22-60)	$\bar{X}$=175 lbs.
Nonparticipants	8 females	$\bar{X}$=30 (24-45)	$\bar{X}$=175 lbs.
	9 males	$\bar{X}$=36 (25-49)	$\bar{X}$=148 lbs.

		SBP/DBP	HR
Stress Participants	females	$\bar{X}$=116/70	$\bar{X}$=78
	males	$\bar{X}$=122/75	$\bar{X}$=71
Nonparticipants	females	$\bar{X}$=119/72	$\bar{X}$=79
	males	$\bar{X}$=124/71	$\bar{X}$=65

Table 1. Demograhic Information for Participant and Nonparticipant Groups and Mean Cardiovascular Measures during initial measurement.

Participation Rates
Ambulatory Monitoring Study

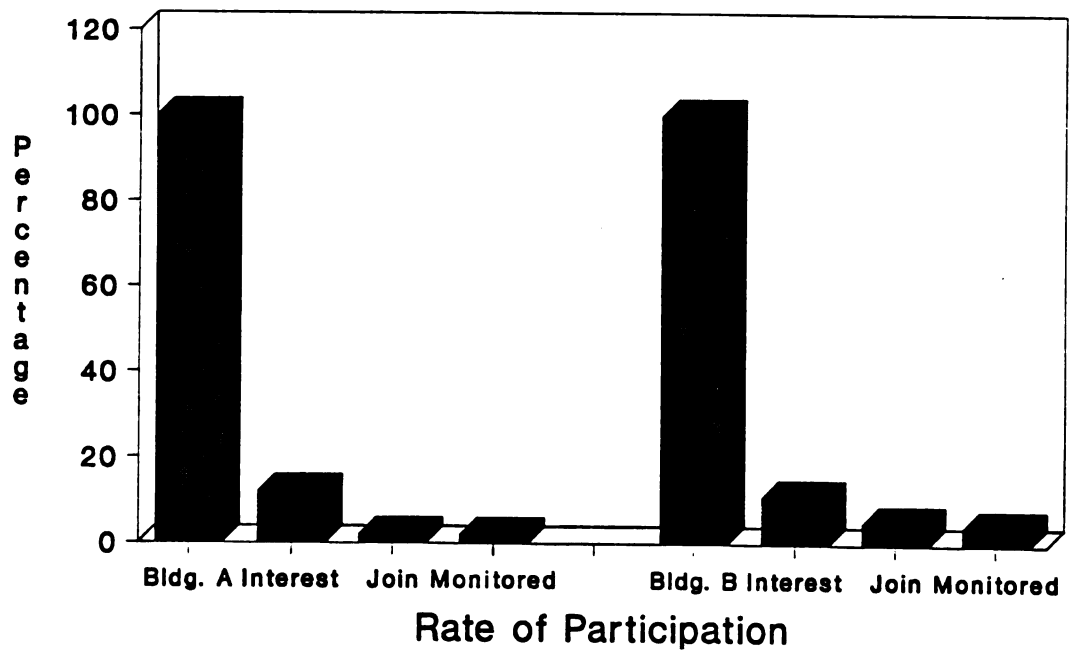

Figure 1

two weeks after the Health Fair, and those who were willing to pay $40.00 as part of the program incentive system. Potential subjects were than asked if they were willing to be monitored. In building A (total = 357) 44 individuals (12% of the building) indicated an interest in the stress management program. At an orientation meeting 2 weeks later, 23 (52% of those interested and 6% of total building population) signed up for the program. Ten (43% of those who signed up and 2% of total building) paid $40.00 as part of the incentive program.

In building B (total = 289) 32 individuals (11% of the building population) indicated an interest in the stress management program. At an orientation meeting 2 weeks later, 20 (62% of those interested and 7% of total building population) signed up for the program. Fourteen (70% of those who signed up and 5% of the total building population) paid $40.00 as part of the incentive program.

The participant was required to pay $40.00 by session number 4 (week 4) and upon successful completion of the program they were told that they would receive the $40.00 back at the end of the program. In building A with 11 participants beginning the program, 10 people paid and one dropped out by session #4. Of those 10 who paid, 9 (90% of stress program participants, 2% of the total building population) volunteered for the ambulatory monitoring study.

In building B with 14 participants beginning the program,

13 people paid and two dropped out due to unwillingness to pay the incentive money and due to a pregnancy. Of those 13 who paid, 11 (85% of stress program participants, 4% of the total building population) volunteered for the ambulatory monitoring study.

Apparatus

The SpaceLabs 90202 Ambulatory Blood Pressure Monitor

A Spacelabs 90202 ambulatory monitor was used to collect the physiological measures of SBP, DBP, and HR while a computerized diary program developed by Van Egeren & Madarasmi (1988) enabled behavioral data to be collected proximal to the time of blood pressure measurements. The monitor weighs approximately 1.5 pounds and can be worn by the subject with relatively minimal interference with daily routines. The monitor must be initialized before the subject wears it. Initialization entails identifying the subject and setting the automated intervals for cuff inflation. The monitor was programed to inflate the cuff every 30 minutes between 8am and 12am and every 60 minutes between 12am and 6am. Ward and Hanson (1983) found an overall high level of reproducibility for SBP using ambulatory blood pressure monitoring. Pearson correlations for SBP were moderate to good during rest and moderate levels of activity ranging form .68 - .80. Pearson correlations for DBP ranged from .53 - .59 for low to moderate levels of activity. Observations took place during two

sequential days using standardized conditions (supine position and submaximum bicycle exercise).

The Computerized Diary Cards

The subject marked a computer-readable, mark-sense diary card during all waking blood pressure measurements to indicate the time of day; location (home, work, car, or other); body position (sitting, standing, reclining); activity (walking, driving, drinking caffeinated beverage, household chores, talking, smoking, attending a meeting, desk work, watching television, reading, relaxing, sleeping); and mood state (happy, angry, rushed, tense, tired, accomplishing things). Subjects rated their mood state on a 5 point scale. The computerized program recognizes consecutive blood pressure readings without a diary entry as a period of sleep. For further information regarding the diary card see appendix A.

The current study used three self-rated measures which included reports of stress, frustration, and accomplishing things. The Stress derived score is based upon an additive combination of three mood states (angry + tense + rushed). The formula for the derived score of Frustration is: (angry - 1) x (tensed + rushed - 2) x (5 - accomplishing things). Note that the components of this formula would be set equal to zero if any one component is not endorsed by the subject, so that all components (ie. lack of goal attainment, motive arousal, and the individual's angry response) form a multiplicative function resulting in the estimated degree of

experienced frustration (personal communication with Dr. L. Van Egeren). An individual is considered frustrated in so far as goal attainment is impeded while drive to reach a goal is aroused. Further, the individual must experience some anger as a response to thwarting of the goal-seeking behavior. The diary system has shown that various mood states are rather systematically associated with various levels of blood pressure, most notably, the more negative the mood state, or "stressed", the higher the blood pressure (Van Egeren & Madarasmi, 1988). Finally, subjects' reports of actual goal attainment, Accomplishing Things, comprised the third self-rated variable.

Procedure

Each subject was monitored on two work days. The comparison group wore the monitor for two 24 hour periods one month apart while the experimental group wore the monitor at the beginning and the end of the stress program. Time 1 measurements (session 1) for the program participants began immediately after the stress management program started and was finished before 3 program weeks elapsed. Time 2 measurements for the program participant group occurred during the last 3 weeks of the stress management program. The average time interval separating Time 1 measurements from Time 2 measurements for the experimental group was 11 weeks.

Each subject was given a detailed written description of

the blood pressure monitor and behavioral diary cards before the first visit to the laboratory at 8am. Prior to the subject's arrival the blood pressure monitor was initialized. The subject then adjusted the monitor to a typical waste belt they were asked to wear and the cuff was adjusted on their nonpreferred arm. The nonpreferred arm was chosen for cuff placement in order to leave the subjects preferred hand free for movement during cuff inflation. The monitor microphone senses the vibrations through the artery and is positioned beneath the cuff above the brachial pulse on the nonpreferred arm. The hose of the cuff was attached to a mercury manometer through a "Y" connector. Three calibration readings were manually triggered while in the laboratory. A duration of 60-90 seconds expired between each reading. The blood pressure was read with a stethoscope microphone placed alongside the recorder microphone by checking pulse sounds against the falling mercury column. The experimenter was "blind" to the ICR monitor readings. To meet the criteria for acceptable reliability, the simultaneous readings by the experimenter and monitor had to agree within 5 mmHg for both SBP and DBP for three consecutive readings. The subject was than given verbal instructions on how to wear the monitor and fill out the diary cards. They were told specifically to hold their arm still while cuff inflation occurred to reduce the possibility of measurement error due to spurious movement.

Following three calibration readings to verify the

accuracy of the blood pressure recorder, the subject filled out a diary card in the laboratory. The subjects' errors on the card, if any, were discussed and corrected. The subject was told to wear the monitor until rising the following morning and to fill out a diary card during each blood pressure reading except, of course, during sleep. Upon arrival at the laboratory the following morning, the data from the monitor were collected and stored in a Zenith 200 PC AT and diary cards were collected.

Program Format. The stress management program consisted of 13 sessions lasting over the course of 6 months. The first 8 sessions met one time a week during the lunch hour. The subsequent 5 sessions met every other week. The program consisted of defining and identifying stress responses, problem solving (Ellis' ABC model), the Jacobson Progressive relaxation technique, a home tape for a visual imagery relaxation exercise, assertiveness training, time management, cognitive restructuring (involving identification of automatic thinking and irrational beliefs), identification of Type A behavioral pattern and related risks, preventative actions toward identifying relapse potential in order to help maintain behavioral changes.

The first 10 minutes of each session began with a cognitive-relaxation exercise. Participants than met in small groups of 3-5 people for 20 minutes to discuss their personal projects and/or the homework assigned to them from the

previous session. After the small group interaction a didactic portion took place for the last 30 minutes. Participants were instructed in both the rationale and skills used in various stress techniques and were assigned a homework assignment the last 5 minutes in the area of the didactic content. Appendix B outlines further details of the program.

Personal Project. The participant developed a "personal project" that was thought to reduce stress in their life. The participant was to spend at least 30 minutes doing their personal project for at least 3 days per week in order for them to not lose 1/2 of their $40.00 deposit. Their efforts were verified by another person who signed a behavioral contract sheet. More specific information regarding personal projects can be found in Appendix B. The personal projects were approved of by a program leader based upon whether the behavior change engaged the participant, appeared to be stress reducing in given the individual's current lifestyle, and was a behavior the participant had not been involved in prior to the stress program. The personal project was thought to help participants initiate and maintain simple techniques while they learned more involved ones, yet these activities were related to specific areas the participant wanted to change from the outset of the program.

Behavioral Contracting and Incentives. The participant filled out a behavioral contract which specified they would carry out their personal project at least 30 minutes, 3 times

a week. They were exposed to other techniques in the program in the form of didactic encounter and homework assignments, however, their incentive money was not contingent upon completion of the homework. If the participant failed to meet their target goal between each session, then one half of the amount of money deposited to them would be given to the other small group.

Program Leaders. The program leaders were five professors of clinical psychology at Michigan State University whose major theoretical orientation is cognitive-behavioral. They were assisted by one clinical psychology graduate student. A few of the instructors have had extensive involvement with stress groups in the past. During each session one professor would discuss a topic area or teach a technique during the didactic portion of the program. One instructor and the graduate student attended all the sessions in order to provide for programmatic continuity.

Data Analysis

Diary card information was read through a card reader which converted the information from binary code to ASCII characters. The data were checked for accuracy using the same criteria outlined by Van Egeren & Madarasmi (1988). After the diary information was corrected for errors, a 24-hour blood pressure report was produced. A professor of clinical psychology examined the reports and noted any elevations that

may suggest further medical attention. All individuals received one of their blood pressure reports in exchange for their time involvement with the study. The blood pressure data were converted from a monitoring file into a data file once the diary cards were corrected for errors. Approximately 75% of the blood pressures were screened by a cardiologist and 25% by a clinical psychology graduate student to delete measurement errors based upon the following marker events: 1) SBP < DBP; 2) SBP is below 50 mmHg at night and 90 during waking hours; or 3) SBP or DBP = 0.

The data were then prepared for analysis by converting the data files into Systat files to be analyzed by a Systat PC software package. A total of 2,164 blood pressure readings were obtained. A multivariate analysis of covariance was used to determine the influence of the factors of Group, Session, and Sex on the physiological variables and the subject report variables. The data were grouped for the analyses based upon the three basic delimiters of human activity: "work", "home" and "sleep", with 1,030, 653, and 481 observations collected respectively.

The model equation to be estimated during each time interval of work, home, and sleep consisted of the following dependent and independent variables:

$$\text{SBP, DBP, HR} = \text{Sex} + \text{Group} + \text{Session} + (\text{Sex} \times \text{Group}) + (\text{Sex} \times \text{Session}) + (\text{Group} \times \text{Session}) + (\text{Sex} \times \text{Group} \times \text{Session}) + \text{Age} + \text{Body Mass}$$

Stress, Frustration, Accomplishing Things	=	Sex + Group + Session + (Sex x Group) + (Sex x Session) + (Group x Session) + (Sex x Group x Session) + Age + Body Mass

with Age, and Body Mass (weight/height) as covariates. The model equation estimating the self-rated variables was not estimated during sleep since the subjects did not mark diary cards during this time period. However, an analysis was performed on SBP, DBP, and HR during this time.

RESULTS

Table 2 shows the mean SBP, DBP, and HR for both comparison and experimental subjects for the three time periods of work, home, and sleep.

Covariates: Age and Mass

Age. A covariate analysis of the contribution of age toward explaining the variance on the physiological variables was significant for the work period (Wilks' Lambda; $F = 16.28$, $P < .001$). A significant amount of variance was accounted for on SBP ($F = 14.20$; $P < .05$) and DBP ($F = 41.86$; $P < .05$). Beta coefficients revealed that an increase in age was associated with an increase in SBP and DBP. The covariate analysis of Age on self-rated Stress also accounted for a significant amount of variance ($F = 20.30$; $P < .001$). Younger individuals tended to rate higher levels of stress while at work ($F = 33.28$; $p < .001$).

A covariate analysis of the contribution of age toward explaining the variance on the physiological variables was significant (Wilks' Lambda; $F = 12.61$; $P < .001$). Age accounted for a significant amount of variance on DBP while at home ($F = 26.61$; $p < .001$). Beta coefficients indicate that older individuals tend to have higher DBP at home. Also, age accounted for a significant amount of variance on the self-rated variables ($F = 3.59$; $p < .05$). Self-rated Stress was related to age ($F = 7.19$; $p < .05$). Like the work

	WORK	HOME	SLEEP
	SBP/DBP	SBP/DBP	SBP/DBP
Female Stress Participants	117/71	119/72	106/57
Male Stress Participants	128/80	123/76	111/65
Female Nonparticipants	115/74	118/72	111/62
Male Nonparticipants	128/77	124/73	111/62

	WORK	HOME	SLEEP
	HR	HR	HR
Female Stress Participants	79	79	67
Male Stress Participants	77	71	63
Female Nonparticipants	79	77	65
Male Nonparticipants	76	67	59

Table 2. Mean SBP, DBP, & HR During Work, Home, & Sleep.

environment, younger individuals tend to report more stress at home. A covariate test of the effects of age on sleep outcome variables (SBP, DBP, and HR) indicated a significant difference (Wilks' Lambda; $F = 7.60$, $p < .001$). The univariate tests reflect differences in SBP ($F = 19.97$; $P < .01$) and DBP ($F= 17.26$; $P < .01$) suggesting that older subjects' SBP tends to decrease during the night compared to younger subjects while their DBP tends to be higher.

Mass. A covariate test of the effects of mass toward accounting for variance on the physiological parameters was significant during the home period (Wilks' Lambda; $F = 2.54$, $p < .05$). Both SBP and DBP were significant (SBP $F = 3.87$; $P < .05$; DBP $F = 6.36$ $P < .05$). Beta coefficients reveal that heavier people, while at home, tended to have lower SBP and DBP.

A covariate test of the effects of mass on the physiological parameters during the sleep period was significant. Both DBP and HR accounted for a significant amount of variance (DBP $F = 9.85$; $P < .05$; HR $F = 3.97$; $P < .05$). Heavier individuals had higher DBP and HR during sleep.

Age and mass appear to be appropriate covariates. Significant amounts of variance are accounted for on both physiological and self-rated variables used in this study.

At Work

Physiological Outcome Variables. A multivariate test of the three-way interaction effect of group membership, time of measurement and sex (Group x Session x Sex) on the physiological variables did not prove significant. Also, the test of the two-way interaction between group and time of measurement (Group x Session) on the physiological outcome variables also lacked statistical significance during work. A multivariate test of the main effect due to group membership was significant on the physiological outcome variables (Wilks' Lambda; $F = 6.29$; $p < .01$). The univariate test revealed that the stress participants had significantly lower DBP ($F = 8.59$; $p < .01$), however this does not appear to be due to the intervention. Therefore, there was no effect due to participation in the stress program on the physiological outcome variables during this time period.

Self-Rated Outcome Variables. A trend toward significance occurred on the multivariate test of the three-way interaction (Group x Session x Sex) on the self-rated outcome variables (Wilks' Lambda; $F = 2.32$; $p = .07$). Since this study is exploratory in nature, the univariate tests of the multivariate trend toward significance will be noted. The univariate test of Accomplishing Things found male stress participants increasing their ratings of Accomplishing Things at Time 2 ($F = 4.24$; $P < .05$) (See Figure 2). Also, the

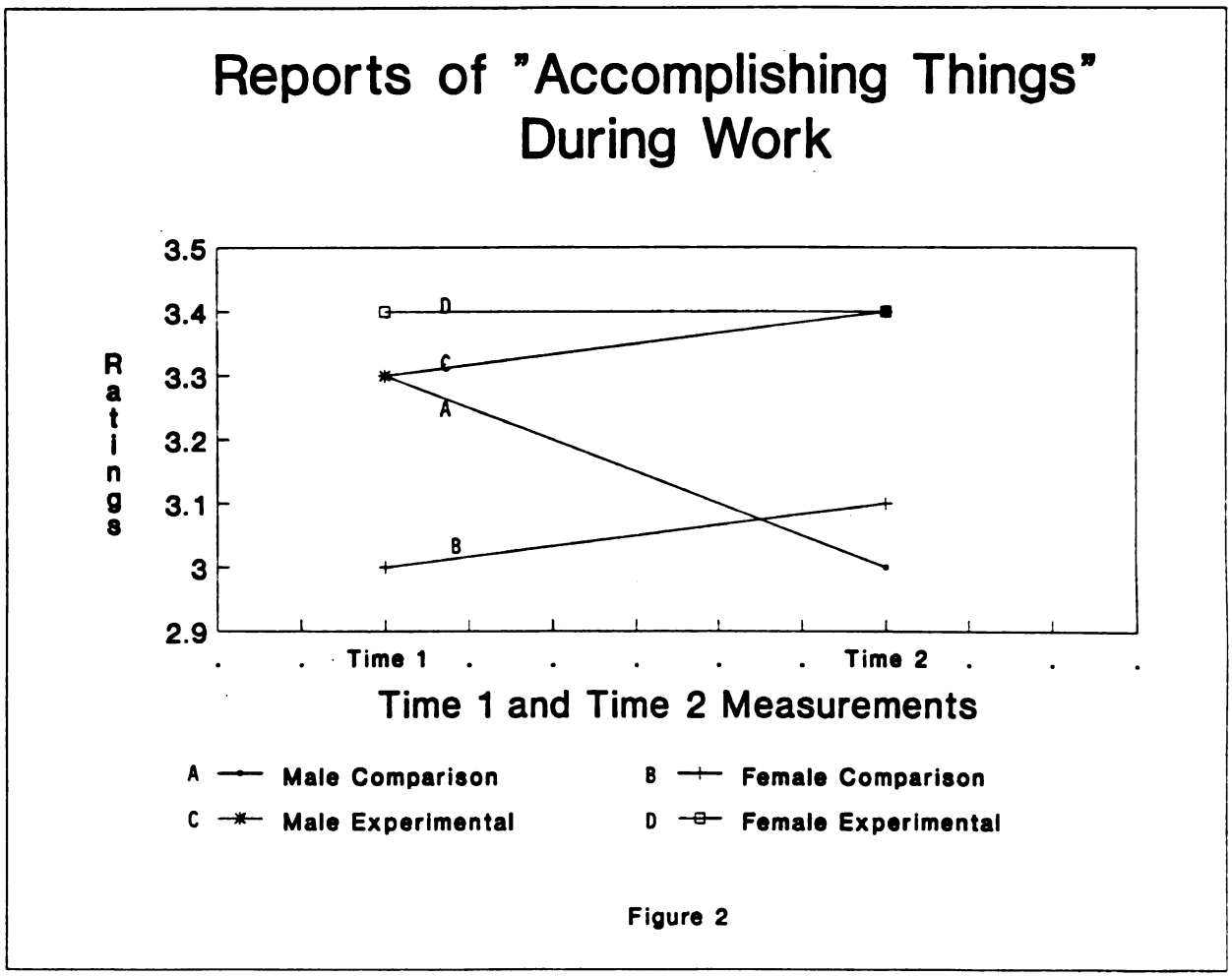
Reports of "Accomplishing Things" During Work
Ratings
3.5
3.4
3.3
3.2
3.1
3
2.9
D
C
A
B
Time 1
Time 2
Time 1 and Time 2 Measurements
A Male Comparison
B Female Comparison
C Male Experimental
D Female Experimental

Figure 2

univariate test of Stress revealed a trend toward significance. Male stress participants tended to increase their ratings of Stress at work during Time 2. However, the comparison group still maintained higher ratings of stress during both measurement periods ($F = 3.11$; $p = .07$) (See Figure 3). The multivariate test of the two-way interaction (Group x Session) was nonsignificant, although the multivariate test of the main effect of group membership was significant on all self-rated variables (Wilks' Lambda; $F = 15.03$; $p < .01$). Stress participants reported less stress ($F = 16.41$; $P < .01$), less frustration ($F = 44.77$; $P < .01$) and had higher reports of Accomplishing Things ($F = 11.73$; $p < .01$) compared to the nonparticipant comparison group.

A significant multivariate test of the two-way interaction between group and sex occurred. Although this interaction effect does not tell us anything about the effects due to the intervention, it is worth noting. Reports of frustration on the job were significantly higher in the comparison group of nonparticipant females ($F = 6.29$; $P < .05$). Nonparticipant females appeared to differ significantly on other dependent measures while at home and during sleep which will be addressed later.

The results do not support any of the proposed hypotheses for the work period. Stress participants' SBP, DBP, and HR

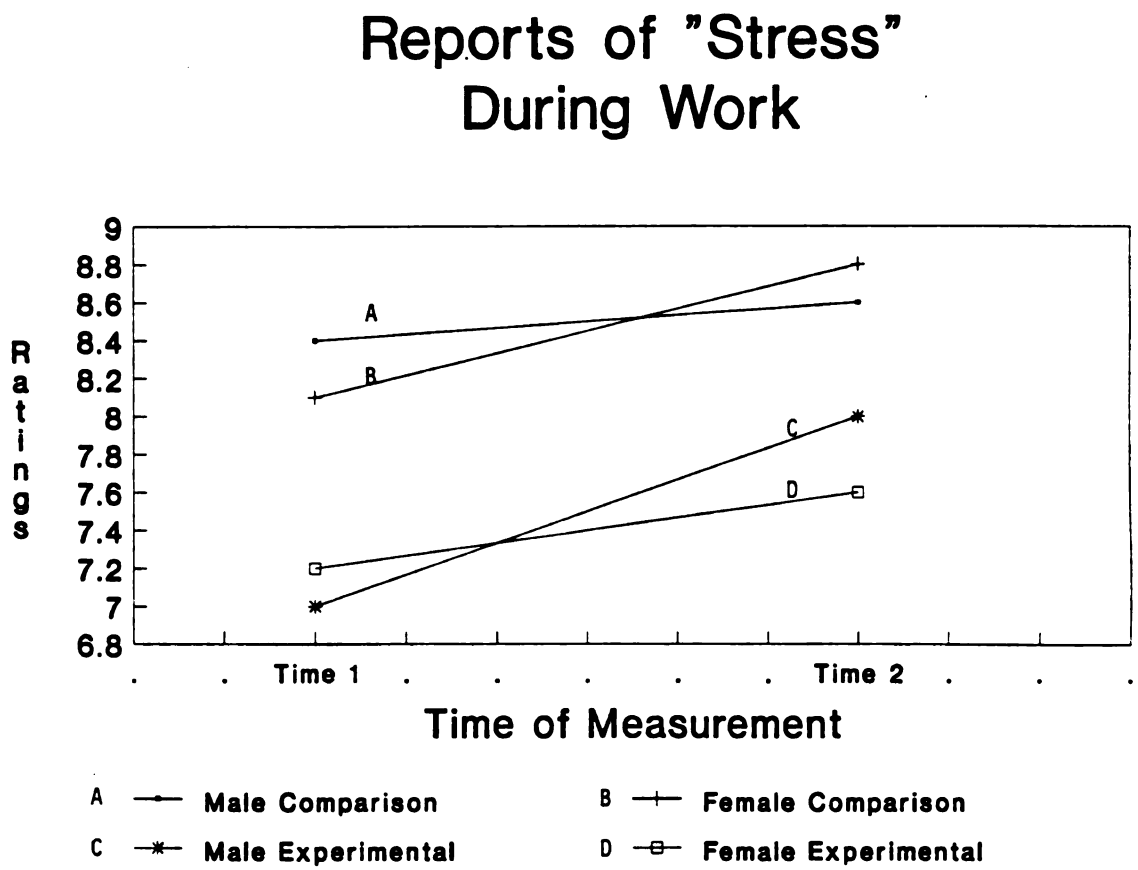
Reports of "Stress"
During Work
Ratings
9
8.8
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
6.8
A
B
C
D
Time 1
Time 2
Time of Measurement
A Male Comparison
B Female Comparison
C Male Experimental
D Female Experimental

Figure 3

did not decrease during work after involvement in a multicomponent stress management program. A multivariate trend toward significance on the self-rated measures revealed an increase in male stress participants higher reports of Accomplishing Things; however, their ratings also reflected a slight increase in Stress while at work.

At Home

Physiological Outcome Variables. The multivariate test of the three-way interaction (Group x Session x Sex) on the physiological variables was nonsignificant. The multivariate two-way interaction (Group x Session) was significant (Wilks' Lambda; $F = 2.65$; $p < .05$) The univariate tests reveal significant differences on SBP; contrary to expectation stress participants blood pressure increased whereas nonparticipants' SBP decreased ($F = 6.36$; $P < .05$).

Self-Rated Outcome Variables. The multivariate test of the three-way interaction (Group x Session x Sex) was nonsignificant. However, the univariate test of Stress reveals a trend worth noting. Like the trend observed above in reports of increased stress in male stress participants at work, (Figure 3) a trend of increased reports of stress occurred for female stress participants at home ($F = 3.42$; $P = .06$). Further research may be needed to examine whether there is a tendency for stress programs to change perceptions

of stress levels in domains that are associated with gender. The trends are in the direction one would expect given traditional sex role expectations; both sexes rated greater amounts of stress -- but only in the domains traditionally linked with their gender.

The multivariate test of the two-way interaction (Group x Session) was significant (Wilks' Lambda; $F = 3.7$; $P < .05$). The univariate tests reveal an increase in frustration ($F = 7.39$; $p < .05$) and stress ($F = 10.7$; $p < .05$) in both the stress participant group and nonparticipant comparison group; however, the stress participants maintained lower ratings of stress and frustration during Time 1 and Time 2.

The multivariate test of the two-way interaction (Group x Sex) was significant (Wilks' Lambda; $F = 13.11$; $p < .05$). Although this interaction effect does not reveal information about the effects of the intervention, it is worth noting for the information concerning women who work, yet do not partake in a stress management program. Nonparticipant females rated higher amounts of Stress ($F = 34.02$; $P < .01$) and Frustration ($F = 14.37$; $P < .05$) compared to stress participant females and both groups of males while at home. However, female nonparticipants had higher ratings of Accomplishing Things compared to both male groups and stress participant females while at home ($F = 11.09$; $P < .05$). Perhaps nonparticipant females' perceptions that they were accomplishing things helped them to cope with higher levels of stress and

frustration.

Figures 4 and 5 reveal the progression from the workplace into the home for both Frustration and Stress self-ratings. Note nonparticipant females' higher rating of Frustration at work compared to all others and how this statistically significant rating is maintained into the home environment (Figure 4). Nonparticipant females' rating of Stress at the worksite was comparable to all others; however, a statistically significant difference in the Stress rating is observed at home (Figure 5). There was no statistical difference in self-ratings of Accomplishing Things for any of the groups while at work. However, like the Stress ratings, nonparticipant females maintained higher levels of Accomplishing Things when observing their home ratings (Figure 6). None of the hypotheses proposed for the home period were validated. Stress participants' SBP, DBP, and HR did not decrease in the predicted direction nor did their subjective reports reveal such decreases. A univariate trend was noted in female stress participants who tended to report more Stress at home at Time 2. This was compared to a trend noted in male stress participants' increased report of Stress at Time 2 while at work. Nonparticipant females in the comparison group reported higher frustration during work which carried into the home period. In addition, their reports of stress and Accomplishing Things remained higher while at home compared to all others.

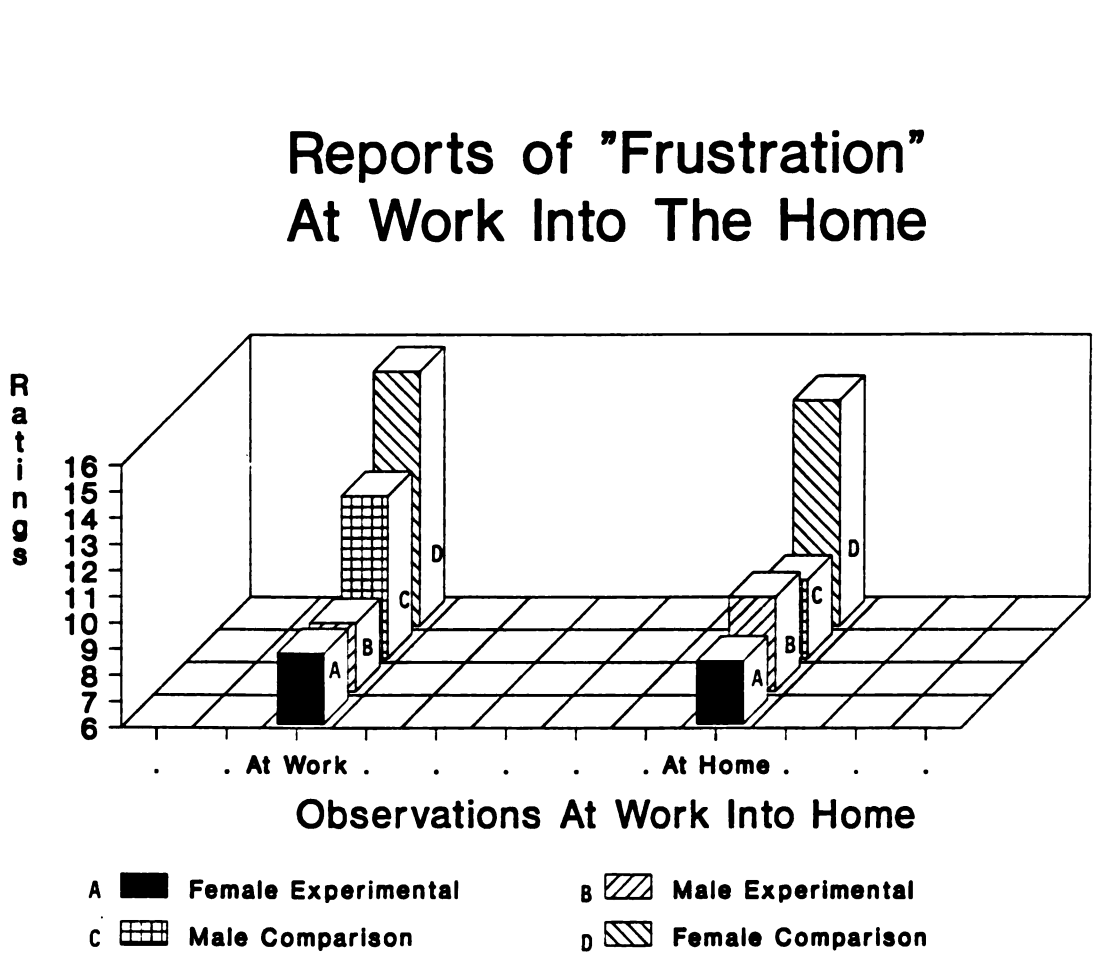
Reports of "Frustration"
At Work Into The Home
Ratings
16
15
14
13
12
11
10
9
8
7
6
A
B
C
D
At Work
At Home
Observations At Work Into Home
A Female Experimental
B Male Experimental
C Male Comparison
D Female Comparison

Figure 4

Reports of Stress
At Work Into Home

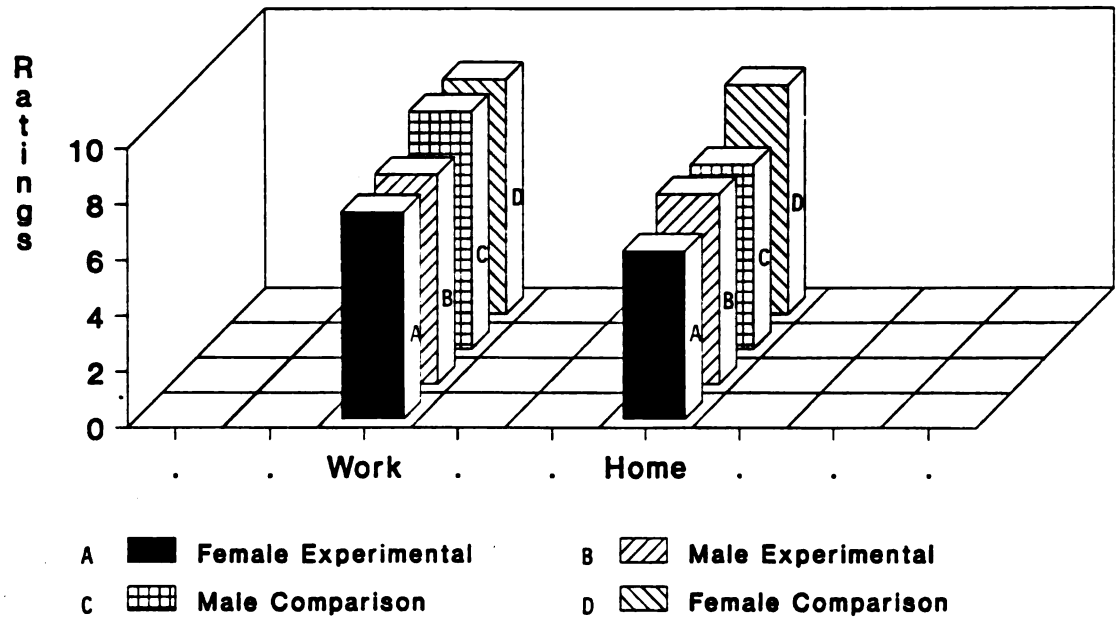

Figure 5

"Accomplishing Things"
At Work and at Home

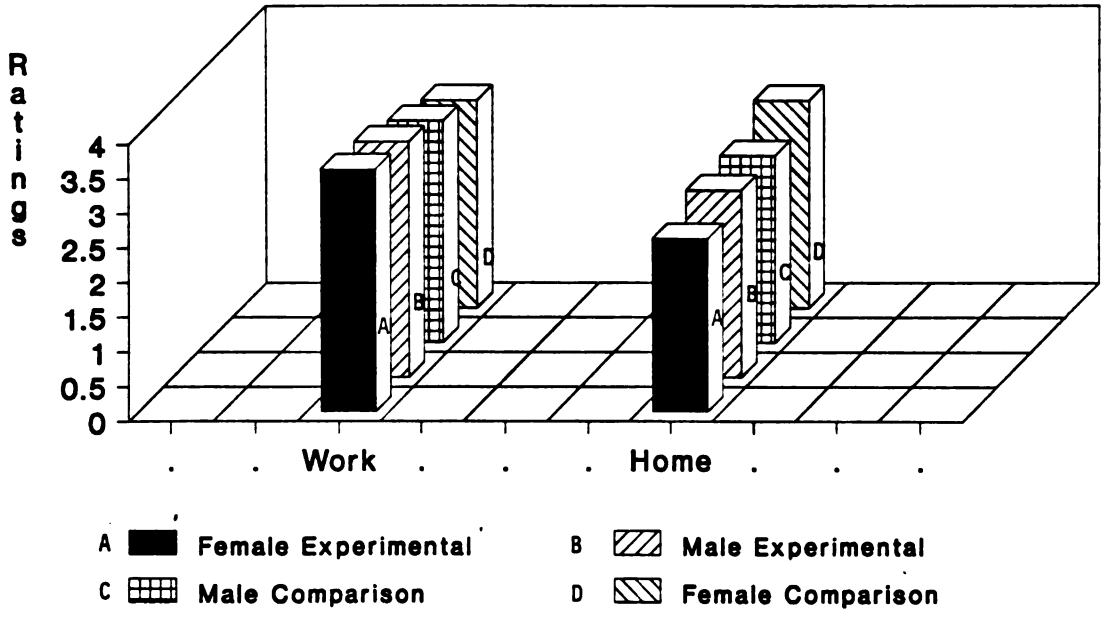

Figure 6

During Sleep

Physiological Outcome Variables. A significant three-way interaction (Group x Session x Sex) on the mulitvariate test occurred ($F = 8.75$; $P < .01$). Univariate tests reveal a significant decrease in HR at night for nonparticipant females ($F = 13.25$; $P < .01$). Counter to expectation, a decrease in DBP in male nonparticipants occurred while male stress participants increased their DBP ($F = .019$; $P < .05$).

A significant multivariate test for the Group x Session interaction occurred ($F = 9.755$; $P < .01$). Counter to expectation, there was an decrease in SBP in the comparison group and an increase in the participant group ($F = 10.51$; $P < .01$). None of the hypotheses were confirmed for any of the physiological parameters during sleep.

DISCUSSION

The three cardiovascular measures of SBP, DBP, and HR did not significantly decline in the predicted direction in the stress participant group during any of the three activity periods of work, home or sleep. This is consistent with the casual blood pressure findings of Drazen et al. (1982) using mild hypertensive individuals and the Sallis et al. study (1987). The Sallis et al. (1984) study, using normotensive individuals, compared the effects of a multi-component, education/supportive, and a specific relaxation intervention but did not find a significant reduction in blood pressure. This suggests that short of a fairly highly structured relaxation intervention (Peters, Benson and Peters, 1977), normotensive individuals have not displayed reductions on blood pressure measures after a worksite intervention.

The other experimental study which found reductions in blood pressure was the Charlesworth et al. (1984) study. The Charlesworth et al. (1984) study implemented progressive relaxation, autogenic training, along with visual imagery, cognitive restructuring, and assertiveness training in a hypertensive sample and noted a reduction in blood pressure up to three years post intervention. The Charlesworth et al. (1984) study should be viewed as conservative since 83% of program participants were on an anti-hypertensive medication. However, 23% already treated by anti-hypertensive medication showed a clinically relevant reduction of more than 10 mmHg

in SBP and 6 mmHg in DBP.

Sallis et al. (1987) suggest low cost, low intensity stress management programs for normotensive employees. They did not clearly define what "low intensity" is, which appears to be an important variable since stress techniques are more effective when they are delivered in a nonsuperficial manner (Leher & Woolfolk, 1987). Though the use of the term "intensity" is an important one, it is not known whether the group or individual format of intervention is more effective, nor whether experience level of instructor is critical as well. However, if the material is presented in a superficial fashion, the program itself would appear suspect.

What has yet to be demonstrated is whether stress techniques taught in worksite stress management programs can decrease arousal in the actual work environment. Up to this point in time evaluation studies have measured blood pressure in the laboratory, in a setting associated with the actual stress intervention, or haven't included a description of where the measure was taken. Agreement between these laboratory, or casual measures and ambulatory measures are often low and may not give an accurate indicator of how the individual responds to real life stressors (Van Egeren & Sparrow, 1989).

This study does not rule out the possibility that blood pressure reductions in normotensive individuals can take place. As illustrated above, prior evidence suggests that

highly structured relaxation can produce such changes in normotensive individuals. However, the current study may offer a type of delimiter, or baseline, for future work. A multicomponent educative-supportive intervention does not appear to reduce arousal in the actual environment. The question still remains -- Does the intervention reduce arousal in the actual environment?

No statistically significant changes occurred on the self-rating measures as hypothesized; however, a few trends were noted. Male stress participants tended to have higher ratings of accomplishing things at Time 2; yet they also reported more stress at Time 2 during the work period. Conversely, a trend toward greater reports of stress while at home was noted in female stress participants at Time 2. The higher ratings of stress in both male and female stress participants was not predicted. However, this finding does suggest a potential gender-linked relationship to rating higher degrees of stress in those domains traditionally associated with one's gender, perhaps as a result of becoming more sensitive to environmental stressors.

However, significant differences did occur in self-ratings of nonparticipant females. This group revealed significantly higher ratings of frustration at work which continued into the home. Also, their ratings of stress were maintained at a significantly higher level when they went home while all others decreased their ratings after they left work.

Female nonparticipants also reported higher levels of accomplishing things at home. It seems these subjects felt they were achieving goals at home given their higher ratings of accomplishing things there, yet they do not appear to be experiencing the home environment as a place to relax from the work day vis-a-vis all others. Future program designs may incorporate skills that teach female participants how to identify and deal effectively with factors that appear to thwart their goal attainment at work and at home.

A concluding comment concerning the future use of ambulatory monitoring in studies of employee stress seems warranted. It may be possible to apply ambulatory monitoring technology to measure physiological variables while also controlling for motoric activity (via an activity monitor) so to measure more accurately the affects of psychological and somatic treatment interventions on sympathetic nervous system activity. (Personal communication by Dr. Lawrence Van Egeren). By controlling for physical activity, one may be able to obtain a measure of sympathetic nervous activity more closely influenced by stress reactions related to negative affect and control for "noise" in measurement due to physical activity. Ambulatory blood pressure monitoring allows us to obtain a more immediate observation of the psychophysiological processes related with the affective and cognitive responses to current stressors occurring during daily activities. Such units can be programed to operate on an automatic time-

interval basis or semi-automatically by having the individual prompt a measure. Blood pressure measurement may be relevant for researchers interested in more transient daily events (such as mood states) compared to hormonal measures. Hormonal measures, aside from collection via the saliva, are relatively peripheral to the time of behavioral response. Blood pressure also has some predictive validity for later cardiovascular disease, such as left ventricular hypotrophy.

The continued study of process measures related to the generalizability of the "relaxation response" using relaxation techniques or the mediation of affect using cognitive-behavioral interventions are well worth pursuing given the current technology available. In addition, ambulatory monitoring and corresponding psychological measurement of in vivo stressors may very well aid in elucidating the effects of chronic verses acute stress events and their impact on the individual. Ambulatory monitoring provides a process measure for the physiological activity of the individual, yet, what is needed is the development of psychological process measures in addition to the physiological measures. In addition to the diary system used in this study, further examination of the frequency and/or intensity of the in vivo stressors one faces would be important in future research. "Linking" the perception of stressor frequency and intensity in an ongoing process to one's mood state and underlying physiological reactivity may help to elucidate how acute and chronic levels

of stressors are involved in pathophysiological processes. The use of such technology may help us to measure the affects of mediating the system of affect via cognitive changes to stress involved in perceptions of threat in a fairly refined manner as well as interventions which intervene solely between cognition and the muscular-skeletal system. However, in those situations where systematic perception of threat involves environmental/organizational practices, one may want to intervene at the systems level, rather then limiting the intervention in the stress cycle to the individual's somatic reaction to it.

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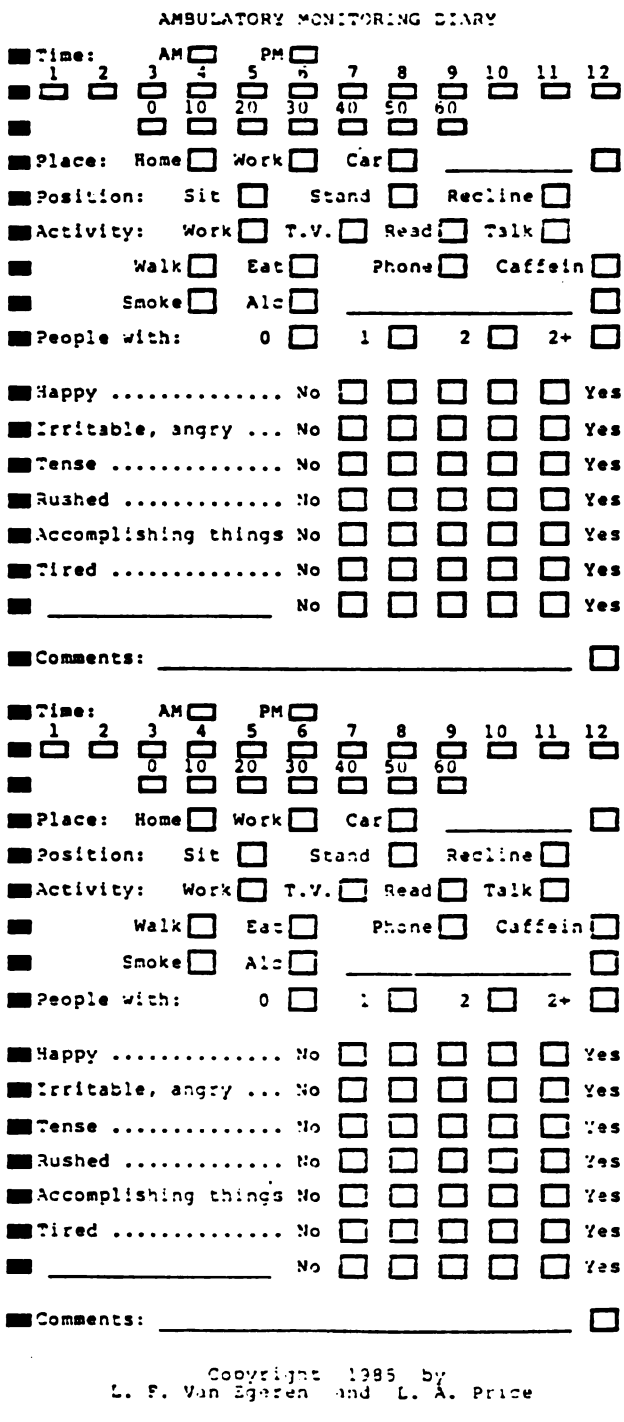
APPENDIX A



AMBULATORY MONITORING DIARY

Time: AM PM
1 2 3 4 5 6 7 8 9 10 11 12
0 10 20 30 40 50 60

Place: Home Work Car _____

Position: Sit Stand Recline

Activity: Work T.V. Read Talk

Walk Eat Phone Caffein

Smoke Alc _____

People with: 0 1 2 2+

Happy ..... No Yes
Irritable, angry ... No Yes
Tense ..... No Yes
Rushed ..... No Yes
Accomplishing things No Yes
Tired ..... No Yes
_____ No Yes

Comments: _____

Time: AM PM
1 2 3 4 5 6 7 8 9 10 11 12
0 10 20 30 40 50 60

Place: Home Work Car _____

Position: Sit Stand Recline

Activity: Work T.V. Read Talk

Walk Eat Phone Caffein

Smoke Alc _____

People with: 0 1 2 2+

Happy ..... No Yes
Irritable, angry ... No Yes
Tense ..... No Yes
Rushed ..... No Yes
Accomplishing things No Yes
Tired ..... No Yes
_____ No Yes

Comments: _____

Mark Sense Diary Card (VanEgeren & Madarasmi, 1988)

APPENDIX B

Description of the "Healthy U" Worksite Stress Management Program
Program Format of Sessions 2-13

10 minutes -- cognitive relaxation
5 minutes -- miscellaneous
15 minutes -- small group discussion of personal projects
30 minutes -- didactic

Session 1 General Introduction

Identifying Personal projects
Explanation of the behavioral contracting system and incentive system
Video on Identifying stress responses

Session 2 Introduction to Cognitive Relaxation

Small group discussion

Session 3 Introduction to Problem Solving

Antecedent-Behavior-Consequence (ABC) Problem Solving Model

Session 4

Jacobson Progressive Muscle Relaxation Exercise

Session 5 Assertiveness

Video on Assertiveness
Identification of Aggressive, Assertive, and Nonassertive Behavior

Session 6 Physical Fitness and Stress Reduction

Physical Activity
Stretching Exercises

Session 7 Health Management

Identification of Internal Reactions of Stress (Thoughts, Emotions, and Physical Sensations)
Identify Behavioral Actions Taken While Under Stress
Identify Alternatives to Current Stress Reactions

Session 8 Type A Behavior Pattern

Identification of Coronary Prone Behavior
Type A Video
Discussion

Session 9 Constructive Thinking

Identifying Automatic Thoughts
Identifying Distorted Thoughts

Session 10 Time Management

Time Management Presentation and Video
Discussion

Session 11 Choices in Changing Behavior

The Process of Accepting Change
The Use of Humor in Stress Reactions

Session 12 Maintaining Behavioral Change

Identification of Events Interfering with Desired Behavior Change

Session 13 Maintaining Behavioral Change

Preparation for Obstacles of Change

Personal Project

Each participant choose to do activities that were thought to reduce stress in that participant's life. Participants choose activities, some of which are outlined below The activities were to be completed at least 3 times each week for no less than 30 minutes. The participants were to have another person verify their activities so to not lose any incentive money.

PERSONAL PROJECTS
1) Full Lunch breaks
2) Rescheduling work periods to keep interruptions at a minimum and increasing time as hobby of organ playing
3) Exercising 3 x week
4) social support building
5) Take breaks during work day
6) Use time management lists
7) Do back exercises (stretching) relaxation
8) take a walk 3 x a week
9) expression of anger and impatience
10) Take full work breaks
11) Slow down thoughts before bed to decrease early insomnia
12) Use heat pad on back every day and exercise 3 x week
13) Take full work breaks
14) Walk to work instead of drive
15) Take daily breaks to go outside from laboratory
16) cognitive relaxation
17) Exercise 3 x weekly

Incentive Program

Each participant paid $40.00 by session 4 as a downpayment for successful completion of their personal project. If they did not complete their contract goal at least 3 times per week for no less than 30 minutes they lost some of their original money they deposited. Each time a participant did not meet their goal the amount of money left over from their original deposit was cut in half and given to other program participants. The participants met in small groups, so if one group had a group member who did not meet their goal, half of the money deposited in their name was given to the other group members, in a separate group, where is was evenly divided. The group which had the group member who did not meet their goal did not receive any of the incentive money.