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Lifestyle Interventions, Stress, and Fitness

by

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Abstract

A lifestyle education and aerobic exercise program was compared to lifestyle education alone, aerobic exercise alone, and a wait list control on measures of stress and fitness. The participants were middle aged sedentary community residents. Treatment programs were conducted over a 12 week period. The Daily Hassles Scale, the Symptoms of Stress Inventory, morning resting heart rate, and a modified Cooper Fitness Test were administered at baseline and every 4 weeks thereafter for the duration of the programs. Repeated measures, multivariate analysis of variance indicated that although the treatment programs did not significantly improve fitness, all 3 treatment programs were effective in reducing stress compared to the wait list control. The findings are of interest because they suggest that participation and not fitness per se was necessary to improve stress levels.

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To family and friendship

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Mens Sana in Corpore Sano

Chapter 1: Introduction

Exposure to change, accidents, relocation, financial concerns, responsibilities, time lines, separation, transition, and interpersonal conflict are some of the everyday stressful events we experience in the course of life. Significant emotional and behavioral symptoms often appear in attempts to adjust to psychosocial stressors and daily hassles. The subjective distress or impairment in functioning associated with maladjustment to psychosocial stressors may also manifest as decreased performance at work, social dysfunction, physical discomfort, emotional disequilibrium, or compromised quality of life.

Costs of Stress

Health Care Expenses. It is estimated that 60-90% of visits to health care professionals are for stress related disorders (Cummings & VandenBos, 1981). Many diseases, disorders, and difficulties of the body are believed to be related to stress. The list includes: cancer, non-cardiac chest pain, low back pain, hypertension, stroke, psoriasis, gastritis, ulcers, tension and migraine headaches, rheumatoid arthritis, and decreased immunological functioning. Furthermore, mental health can be very much affected by stress. Adjustment disorders may develop in response to daily stressors and manifest as depressed mood, anxiety, disturbance of conduct, mixed disturbance of emotions and conduct, physical complaints, or social withdrawal (DSM-IV, 1994). Other mental health disorders, such as conversion disorder, anxiety, depression, and dissociative identity disorder are also associated with stress (Antoni et al., 1991; Fawzy et al., 1990; Goodkin, Fuchs, Feaster, Leeka, & Rishel, 1992; Lennox, Bedell, & Stone, 1990; LePerriere et al., 1990; Pelletier, 1977; Pettingale, Greer, & Tee, 1977; Sherwood, Light,

& Blumenthal 1989). Stress is also implicated in affecting such behaviors as substance abuse and cigarette smoking (Health & Welfare Canada, 1990).

Corporate Expenses. Not only does stress take a toll on health and the health care system, costs to the business sector are also apparent. Stress has been found to negatively effect work productivity, absenteeism rates, job dissatisfaction, terminations, and litigation for stress disabilities (McLeroy, Green, Mullen, & Foshee, 1984; Seamonds, 1983). In the United States, reports from the Bureau of National Affairs (as cited in Pelletier & Lutz, 1991) indicate that about 50% of worker absenteeism could have been avoided with appropriate attention to the physical and emotional needs of employees. The cost of neglecting these needs is often remarkably high. For example, AT&T estimated the medical expenses for a single employee suffering a heart attack to be about \$60,000 (Pelletier & Lutz, 1991). Matteson and Ivancevich (1988) report that U.S. industry has an annual decrease in work productivity worth \$17 billion due to stress related problems and that \$60 billion is lost annually due to stress related physical illness. The authors further estimate that stress costs are on average 7 percent of sales or over twice the percentage of profit. There are other less obvious but more insidious effects of stress in the workplace which may manifest as lost opportunity, poor decision making, improper management as well as premature retirement, or even death before an individual has been able to maximize his or her potential.

Benefits of Coping

Health Benefits. As the treatment of disease by methods of modern medicine has become more and more successful, the most significant gains are now to be made in the area of primary prevention medicine. Primary prevention efforts consist mainly of

lifestyle modifications. Physical activity and active lifestyle seem to translate into significant benefits and savings including reduction of ill health along with increases in work productivity and positive social behavior. Stephens and Craig (1990) found that for Canadians aged 25 years and older, consulting a physician three or more times a year was more frequent among those who were less active. According to the Osteoporosis Society of Canada (1992) young women who increase their level of physical activity and calcium intake by a modest amount can reduce the risk of osteoporosis at age 70 by almost one-third. As a result of physical activity and calcium supplements, reduced hip fractures from osteoporosis could result in substantial savings to health costs. However, a high proportion of the populations of industrialized countries report that they engage in virtually no regular exercise. Approximately 30% of the population of North America (Stephans, 1987) and of Australia (Bauman, Owen, & Rushworth, 1990) do no regular exercise. Implementing lifestyle education and exercise programs in the workplace would make primary prevention medicine accessible and could thereby increase coping capability as well as decrease stress levels on a large scale.

Work Benefits. Lifestyle education and exercise programs are reported to have many direct and indirect benefits, including “enhanced employee morale, improved corporate image, ability to attract and retain key personnel, consistency of a corporate product with the image of a healthy company, and perks for key executives” (Pelletier & Lutz, 1991, p. 485). A Canadian report from the International Conference on Exercise (1988) found that industrial benefits from appropriate type of physical fitness programs affected enhancement of corporate image, increase in worker satisfaction and productivity, decrease in absenteeism and personnel turnover, and in some instances,

decreases in industrial injuries. More specifically, disability days reported in a large American corporation were reduced by more than 12% at work sites where a comprehensive workplace health promotion program, including physical activity, had been implemented for two years (Betera, 1990). In Texas, a 5 year workplace fitness and health education program at the Prudential Insurance Company demonstrated a 47.5% reduction in major medical expenses, a 20.1% decrease in absenteeism, and a reduction of 31.7% in costs directly related to health problems (Bowne, Russell, Morgan, Optenberg, & Clarke, 1984; Rosenstein, 1987). A study of employee turnover during a 4 year period in a corporate health and fitness program in a medium sized corporation in the U.S. reported that the probability of continued employment was significantly greater among exercisers than non-exercisers (Tsai, Baun, & Bernacki, 1987). The study concluded that the provision of an exercise program in a corporation is probably financially beneficial.

In Canada, workplace fitness programs resulted in significant reductions in corporate health care costs. A 1983 study indicated direct annual savings to OHIP of \$130 for every program participant (Fitness Canada, 1988). In another report, workplace physical activity programs were found to improve employee health and wellness, increase productivity and correlate with greater job satisfaction in more than half of the companies surveyed (Craig, 1993). Shepard, Cox, and Corey (1987) report that participation in workplace fitness programs increases employee satisfaction as well as quality and quantity of employee output. In Saskatchewan, it was found that for every \$1.00 spent on employee wellness, there was a \$1.82 return on investment in terms of reduced absenteeism (Vance, 1991). Finally, a 10 year follow-up study of the Canada Life

corporate fitness program reported an average 9.6% decrease in absenteeism per year among the employees in the program (Canada Life, 1991).

The Problem

The problem with the above reported positive effects of lifestyle education and exercise is that most often the effects are not empirically validated. Exercise and lifestyle education programs appear to have a significant effect on health and well-being; however, controlled research investigating the differential effects of program components is lacking.

The Rationale

With the growing popularity of primary prevention medicine and corporate funded fitness programs, it becomes more important to collect evidence under controlled conditions validating the effectiveness of lifestyle education and exercise training programs. Furthermore, clarifying the active ingredients of programs is necessary in order to ensure that they include effective components. The study reported in this thesis was designed to address the issue of empirically validating components of primary prevention medicine.

Overview

The current chapter has provided the context for the present study. In the following pages, the literature review will cover theoretical perspectives on stress and coping, techniques and strategies for successful coping, effects of exercise and lifestyle education, and conclude with an explication of the research questions addressed in the present study. The method section, chapter 3, will describe the sample, the procedure used, the measures used to evaluate stress and fitness, and the data analysis used to

answer the research questions. The results section, chapter 4, will describe the treatment effects grouped according to the research questions. Chapter 5 contains an explanation of the results in the context of contemporary self-efficacy theory, strengths and limitations of the study, implications for future research, and conclusions.

Chapter 2: Literature Review

Introduction

Concerns about stress and levels of stress appear to be particularly high in current western industrialized civilization. The pace of life seems to have become faster, with the tools and machines of modern technology creating new demands while not always providing additional resources in equivalent measure. Increased demands on time and greater expectations of productivity seem to have created a modern culture ripe with stress.

Although stress in the modern era has its own unique flavor, stress has always been an obstacle with which human beings have had to contend. Hans Selye (1980a), a pioneer in the field of stress research has put it this way:

Nowadays, everyone seems to be talking about stress. You hear it not only in daily conversation but also through television, radio, the newspapers and the constantly increasing number of conferences, stress centers, and university courses that are devoted to the topic... The businessman thinks of it as frustration or emotional tension, the air traffic controller as a problem in concentration, the biochemist and endocrinologist as a purely chemical event, the athlete as muscular tension. This list could be extended to almost every human experience or activity, and somewhat surprisingly most people ... think of their own occupation as being the most stressful. Similarly, most of us believe that ours is the "age of stress", forgetting that the caveman's fear of being attacked by wild animals while he slept, or dying from hunger, cold, or exhaustion, must have been just as stressful

as our fear of world war, the crash of the stock exchange, overpopulation or the unpredictability of the future (p. 7).

Regardless of a person's occupation, social position or place in time, effective coping skills are required to deal with stressors, noxious events and overtaxing demands, if the effects of stress are to be curtailed. Individuals experiencing the day to day challenges and exigencies of life need adequate coping techniques to sustain physical and psychological well-being. Otherwise, when the demands of life overwhelm and one becomes stressed, there are a number of potential consequences that may ensue. Work, personal health and quality of life may all be affected. Repeated studies have shown that as work related stressors increase, employee health decreases resulting in lower productivity, heavy demands on employee assistance benefits, increased employee turnover, lower job satisfaction and increased absenteeism (Health & Welfare Canada, 1990a). Symptoms of stress also correlate with an array of unhappy medical consequences. Rabkin and Struening (1976) name a few:

... sudden cardiac death, myocardial infarction, accidents, injuries, tuberculosis, leukemia, multiple sclerosis, diabetes, and the entire gamut of mild medical complaints. High scores on checklists of (stressful) life events have also been repeatedly associated with psychiatric symptoms and disorders... (p. 1015).

Stress in response to overwhelming demands may manifest as physical disease or as psychiatric disorder, but stress may also have a more subtle and insidious manifestation in the form of compromised performance and diminished psychological well-being. Ineffective coping may impair quality of life by making people distracted, emotionally unavailable to loved ones, unable to attend to present experiences, short tempered,

nervous, quick to panic, hasty, inefficient, insecure and generally unable to take joy, satisfaction, and contentment from daily activities.

Identification of coping techniques that prove successful in attenuating stress in response to life's challenges would aid both the individuals experiencing the stress as well as those individuals who pay monetarily for societies' discontent. Facilitating coping skills could relieve stress and result in physical and psychological well-being but could also improve work productivity, reduce costs to employers, and provide significant savings to health care systems. Research into the relative effectiveness of coping techniques would have useful application in educational policy, health care prescription, employee assistance programs, and public health policy, and would also be useful for agencies which market multi-disciplinary and multi-level strategies for encouraging people to be more physically active and lifestyle conscious. Finally, dissemination of the techniques would improve quality of life in the general public and thereby foster the prevalence of community well-being.

Fitness training and healthy active lifestyle education are likely candidates for promoting efficacious coping skills. The scientific literature provides evidence that exercise and lifestyle education relieve the impact of psychological and physiological stressors. Provision of fitness training and healthy active lifestyle education are clearly warranted if they are useful tools for alleviating stress and the physical, psychological and social consequences of stress.

In what follows, the scientific literature on stress and coping will be reviewed. First, conceptualizations of stress and coping will be explicated. The ways in which stress comes to affect our lives will be examined from both a physiological and from a cognitive

psychological perspective. Next, two different categories of effective coping strategies will be considered along with evidence of their impact on physical, psychological and social well-being. Finally, the outcome of lifestyle education programs and aerobic exercise programs will be reviewed. Thereby, the need for the present study will be justified.

Conceptualizations of Stress and Coping

The phenomena of stress and coping seems to be at the forefront of contemporary popular interest. The speed, urgency, and strain of 20th century living has driven many to seek out counter balancing forms of coping. Along with such popularity comes some confusion about what it is exactly that is being talked about when the terms stress and coping are used. Ambiguity is evident not only in casual conversation, but also apparent in the formal scientific and theoretical reports on stress. The terms have been used in a variety of different ways, as such, it will be helpful to first employ an historical perspective to better understand the modern phenomenon of stress under study. The meaning of “stress and coping” will be then be examined and clarified in terms of its modern usage.

Historical use of the term stress. The word stress derives from the old French word *estresse*, meaning narrowness or oppression which seems to imply a feeling of confinement or restriction of liberty. Stress also has origins in the Latin word *stictus*, meaning strict. Again, implying feelings of tightness or tension, requiring discipline and unwavering course. In the 14th century, the term was used in a more general way to describe hardship or adversity (Lumsden, 1981). By the 17th century, stress was being used to describe engineering difficulties; for example, stress is thought to be created by

the impact of a load on a structure which thereby creates strain on the structure and potential for the structure to break or fracture (Hinkle, 1973).

In the 20th century, dictionaries defines stress as a constraining or impelling force demanding effort. Contemporarily, the word is generally used to describe events where external demands impinge and create feelings of discomfort, but where feelings are involved an interpretation is implied. It seems that interpreting an event as being stressful or not, requires an intermediary process which accounts for the interpreting. A load on a structure or system is not considered stressful if there is no strain. A fly on a bridge is definitely a load but it does not create strain and so is not considered stressful. The nature of the load and the thing loaded upon, as well as the relationship between the load and the structure, are of crucial importance. Without this interrelation it would be difficult to know if the qualities of stress, tension, oppression, or hardship are manifest. As such, the word stress seems to be describing a condition which is in some degree determined by relative conditions as well as interpretation.

Although stress is to some degree an idiosyncratic experience, there are enough consistencies in its usage that it makes for a meaningful concept. Matteson and Ivancevich (1988) explain how stress tends to be used in two distinct ways. Sometimes it is used to refer to a force acting on a person which causes discomfort. In this case, stress is a compound, or combination, of both stimulus and response. Using the term stress to refer to both a stimulus and a response tends to be the common way it is used in everyday speech. Here it is ambiguous whether stress refers to the thing causing a response or if it refers to the response itself. For example, if one says, "The stress in my life is getting

worse”, then it is not clear if the person is referring to the events and circumstances in their life or to their reaction to the events and circumstances in their life.

In more technical circles, stress is understood only as a response; with the stressor being the stimulus for the response. The stressor may be an event, an object, or a situation that is seen as disruptive and the response to a stressor is termed stress. However, within the understanding of stress as response to stressors there is division. Some (Lazarus & Folkman, 1991; Hiebert, 1987; Magnusson & Ekehammar, 1975), propose that stress is a response which depends on the demands and pressures of a situation being judged as beyond one’s capacity to cope, beyond one’s available resources. As such, stress is thought of as occurring when demands exceed perceived ability to cope. Others (Baum & Fleming, 1993; Selye, 1980b) suggest that stress is a unitary concept because there are independent variables which consistently elicit the response of stress. Stress, in this case, is a non-specific response to any demand.

In the mid 20th century, there emerged distinct scientific camps in the research of stress. The distinct research orientations were for the most part headed by Hans Selye and Richard Lazarus. It was not so much that these researchers were at odds with one another or that their conceptualizations of stress were incompatible, as much as that each came to the study of stress from a different theoretical discipline: Selye as a bio-physiologist and physician, and Lazarus as a cognitive psychologist. Each developed prominent bodies of research in the modern field of stress.

Stress as a physiological reaction. Selye’s (1936, 1946) overarching explanation of stress is embedded in what is known as the General Adaptation Syndrome (GAS). The proposition is that stressors make a demand on a person for readjustment; that is, a

demand for adaptation, in order to restore normalcy, or homeostasis. The response to the stressor is non-specific in the sense that no matter what causes the stress, there is always a need to adjust and adapt. All living organisms need to evaluate what is predictable, controllable, and harmful in the environment in order to survive. The GAS is engaged when stimuli are present to which an organism has not yet adapted.

The GAS follows a predictable course: alarm, resistance, and if the resistive powers are depleted then exhaustion. First there is alarm which is marked by a shock and a countershock phase. Shock is the body's immediate reaction to the stimulus and it is characterized by various signs of injury. Countershock is the rebound or reaction which is characterized by mobilization of the body's defense. The second stage is one of resistance at which time there is adaptation to the stressor and the decrease or disappearance of alarm. At this time resistance to other novel stimuli is weakened. Finally there is a stage of exhaustion which occurs only if the stressor is sufficiently severe and prolonged.

The GAS is a defense mechanism activated in the face of any threatening event in attempt to lower psycho-physiological disturbance with the goal of regaining equilibrium. There are certain behaviors that we learn will contribute to survival in the face of threatening dangers; however, managing aversive environmental conditions has limitations. An organism has finite resources available for adapting to an environmental situation. If an organism's resources and energy are depleted in an effort to adapt to the environment, then it may become diseased and perhaps die before it can regain equilibrium. Furthermore, the efforts of struggle against the stressor may in and of itself be more harmful to the organism than the direct effects of the noxious stimulus due to the adaptational toll exacted in coping. As Matteson and Ivancevich (1988) point out, the

more frequently the GAS is activated, and the longer it remains activated, the more of a toll it takes on the body. Furthermore, the effects of stress are hypothesized to accumulate in the body over time. If recuperation is not complete and equilibrium cannot be regained before the onset of the next stressor, then the individual may experience an accumulation of stress.

There is a kind of purity in Selye's explanation of stress. He defines stress in terms of the body's non-specific response to a demand and his emphasis is on the physiological activity accompanying exposure to novel stimuli. The GAS is a physiological response system. Physiological excitation in response to a novel stimulus is stress pure and simply. Whether the response is felt as exciting or fearful is a matter of interpretation, but both responses would be considered stressful. Selye's model does not highlight the influence of psychological phenomena that organisms have in response to threats or challenges; namely, idiosyncratic perceptual, behavioral, or emotional reactions to demands.

Stress as a multi-dimensional reaction. In the 1950's Lazarus and his colleagues (Lazarus, & Eriksen, 1952) began to formulate a theory of stress and coping which accounts for intervening variables between the stressor and the distressed reaction. These researchers noticed that the same external events could produce different reactions in different individuals and even different reactions in the same individual at different times. The most likely explanation was that individual motivational and cognitive variables produce different interpretations of stressful events and thereby different reactions ensue. In this dynamic model of stress and coping, there is first a causal influence, then an evaluation of whether the influence is noxious or benign as a function of one's perceived

coping ability, then the elicitation of a coping defense, and finally there is a pattern of effects on the mind and the body (Lazarus, 1993).

Lazarus' model of stress and coping reflects the rise of cognitive psychology in late 20th century North America and the predominant use of transactional models in the explanation of psychological processes. A transactional model is one in which there is an exchange between the individual and the environment. When a person responds to an environmental stimulus the environment thereby changes which in turn affects the individual, who then responds and once again shifts the environment. The process is one of reciprocal influence in which the individual both influences as well as responds to his or her environment. Central to this movement is the replacement of the stimulus-response model of animal learning with the stimulus-organism-response model. From the GAS perspective, stress occurs when demands tax resources, but idiosyncratic appraisals and coping processes mediate the stimulus-response equation. Thus, from the transactional perspective, psychological processes become individualized; such that, stress occurs when there is an interpretation that demands exceed resources. As Lazarus states,

“I began to view appraisal as a universal process in which people (and other animals) constantly evaluate the significance of what is happening for there personal well-being. In effect, I considered psychological stress to be a reaction to personal harms and threats of various kinds that emerged out of the person-environment relationship.” (Lazarus, 1993, p.7)

Psychological appraisal is a crucial mediating factor for the quality of cognitive and emotional reactions to stressors. Stressful events can be made more threatening or more benign depending on cognitive and emotional understanding. A positive emotional

valence may result from a cognitive emphasis on the potential for exercise, mastery, and gain; whereas, a negative emotional valence may result from a cognitive emphasis on potential harm or loss. Furthermore, threat can be self-amplified by casting doubt on one's ability to meet the demands of a situation. Perceived inability to cope with the demands of a situation generates aversive arousal which may then elicit a flurry of negative beliefs, actions, and emotions. Panic may feed back into the appraisal of the situation and further generate anticipatory fears resulting in more negative meaning from the situation than is actually occurring or warranted given the facts. Conversely, perceiving a demanding event as within one's ability to cope may diminish the threat of the experience and make it more of an exciting challenge. Stressors are open to interpretation. Pure sensation and the physiological reaction to sensation can be amplified or diminished depending on the interpretation of the experience; that is, depending on one's perceived ability to cope with the demands of the situation.

In the transactional model of stress, stressful reactions depend on an appraisal that an adequate response to the situation is not available. There is a perceived degree of imbalance between demands and coping resources (Coyne & Lazarus, 1980; Hiebert, 1988). However, a situation, no matter how noxious, may be appraised as manageable and therefore desired, challenging, interesting, non-threatening, non-harmful, and not stressful. Whether an event is deemed a challenge or a threat is a judgment with an emotional overlay. To see a situation as a challenge is a judgment that the demands of the situation can be met and overcome. A confident reaction is elicited if an adequate response is deemed available; that is, if there is a perceived balance between demands and coping resources. The cause of stress is not simply inherent in a situation, it depends on

judgment and resulting emotion. The emotion elicited, whether it be confidence or fear, feeds back into the person's perception of the situation and influences one's judgment of ability to cope. In this way, the transactional model formulates stress as a perceived demand/coping imbalance.

Coping transactions. Coping can also be thought of as a mediating variable in the outcome of stress. From a transactional perspective there is an ongoing series of appraisals, responses, and transformations of the situation. Once the demands of a situation are assessed, and one's capacity to cope appraised, a response is then made or not. A coping response or the absence of a coping response has repercussions. How one copes affects a change in the situation which is then subject to further appraisal, and further coping. If no coping response is made to a stressful situation there is still a situational transformation. For example, if there is no active attempt to deal with a perceived demand, stressors will still elicit a physiological reaction and health may be affected; thereby, changing the internal environment. On the other hand, if a more active attempt to cope with stressors is initiated, either by reducing the stressors, increasing resources to cope or by changing one's reaction to the stressors, then the response will affect a change in the situation which may have a more beneficial effect on further appraisal of demands and one's perceived ability to cope.

Although coping determines subsequent environmental conditions, coping itself is considered neutral with respect to outcome. Coping is simply an attempt to deal with a demand, regardless of effectiveness. The actual adaptive value or effectiveness of a strategy does not determine whether it is coping behavior or not. Moreover, Houston and Hodges (1970) found that denial in stressful situations had a positive effect on

performance. However, the demands of a situation, if ignored, may continue to grow and ultimately become unavoidable. No matter how dysfunctional a strategy may appear to be, it is still coping in the sense of being an attempt to deal with a demand.

Depending on the reaction given in response to a demand, one will view circumstances as within one's means or not; challenging or stressful. In Lazarus' transactional model of coping, first the stressful circumstance is appraised. Next one appraises one's own resources and capacity to handle the situation. A coping strategy is then employed. There is a transaction between the stressor and oneself and finally a re-evaluation of one's circumstances is conducted and the process begins again. The process evolves upon multiple appraisals and reappraisals and the individual's cycling appraisal of his or her coping options and abilities factors into the appraisal of the challenge or threat (Lazarus & Folkman, 1991).

Folkman and Lazarus (1991) factor analyzed their ways of coping questionnaire and identified 8 distinct forms of coping. The first 3 methods seem to have inherent hazards and possibly negative ramifications: confrontation motivated by anger, escape-avoidance motivated by fear, and distancing. The other 5 ways of coping are clearly more beneficial: self-control behaviors, seeking social support, accepting responsibility, problem solving, and positive reappraisal. Lazarus and Folkman (1984) emphasize that no strategy for handling stress should be considered inherently better or worse than any other. Evaluations about the adaptiveness of a coping strategy should be made contextually using as evidence the emotional and functional outcome of the coping strategy.

Coping with Stress

There are many techniques to facilitate adaptive coping which if learned and applied in stressful situations tend to positively affect the transaction between the person and their environment resulting in effective, productive functioning. When successful coping is achieved, one's resources and ability to cope with demands are seen in a positive light and therefore the demands of the situation do not appear to be as threatening. There are two general ways of facilitating successful coping. One way, stressor management, is to reduce the stressors in one's environment and/or to increase one's resources to cope with the stressors. The other way, stress management, is to alter one's reaction to stressors.

Stressor Management

Stressor management is a direct coping strategy whereby attempts are made to change the situation by reducing demands so they are within one's coping ability or by increasing resources to cope so the demands can be adequately met (Hiebert, 1988). Stressor management focuses on dealing with the situation by changing the external or internal environment. The demand/coping imbalance may be dealt with proactively by changing or reducing demands or, when this is not possible, by increasing one's resources. Learning new skills and management techniques or securing assistance from one's community are ways in which resources can be augmented and the negative impact of stressors can be curtailed. Increasing coping resources can be achieved through robust nutrition, and regular exercise.

Nutrition. Bolstering nutrition in times of stress is an effective stressor management coping strategy that increasing resources so that the bodies natural balance

can be maintained and demands can still be dealt with productively in times of stress. The body responds to stress with a series of physiological changes (Brown, 1990; Giff, Washbon, & Harrison, 1972). One of the most prevalent responses is increased production of adrenal hormones. Increased adrenaline productions speeds up the bodies metabolism of fats, proteins, and carbohydrates in order to provide the body with increased energy. Accelerated metabolism causes the body to excrete potassium, amino acids and phosphorus, as well as depleting stores of magnesium which in turn makes it difficult to store calcium. Furthermore, the body does not absorb nutrients well under stress. The result is that the body is depleted of nutrients and cannot easily replace them under times of acute or chronic stress. Malnutrition, in turn, has detrimental effects on the functioning of the immune system (Chandra & Kumari, 1994). Many of the physical disorders that arise from stress may be due to nutritional deficiencies, especially deficiency of the B-complex vitamins (Committee on Diet and Health Food and Nutrition Board, 1989; Health & Welfare Canada, 1990b). B-complex vitamins are important for proper functioning of the nervous system. Nutritional support in times of stress includes many components. Sufficient intake of nutrients especially protein, magnesium, potassium, and phosphorus are essential along with supplementing the diet with complex-B vitamins (Balch & Balch, 1997; Eckholm & Record, 1980).

Exercise. On a physiological level research is plentiful on the stress reducing properties of physical exercise. Many investigations have found that aerobic exercise training decreases cardiovascular reactivity to stress as well as decreases heart rate recovery time following exposure to stress (Blumenthal et al., 1990; Hollander & Seraganian, 1984; Holmes & Roth , 1985; Holmes & McGilley, 1987; Roth & Holmes,

1987; Sherwood et al., 1989; Sinyor, Golden, Steinert, & Serganian, 1986). Light, Obrist, James, and Strogatz (1987) studied 174 men aged 18-22 years who self-selected into low moderate and high exercise groups. They found reduced cardiovascular responses to stress and lower incidence of hypertension were associated with increased aerobic fitness. They explain the stress reducing effect of aerobic training as due to its ability to decrease resting heart rate and blood pressure which thereby decreases the production of adrenaline. Aerobic exercise training has also been shown to have a significantly positive effect on immune measures (Antoni et al., 1991; LaPerriere et al., 1990).

On a cognitive level, evidence indicates that exercise has many benefits and ameliorates coping resources. Improvement in self-reported problem solving and cognitive ability following aerobic exercise is a reliable effect. Physical activity appears to positively affect cognition and intellectual processes. Clarkson-Smith and Hartley (1989) in a study of men and women aged 55-91 years old who self-selected into high and low exercise groups found that individuals in the high-exercise group performed significantly better in tests of reasoning, working memory, and response times. Running is also associated with clarity of thinking and increased capacity to synthesize information both during the exercise and within a short time thereafter (Johnsgard, 1989).

Pro-social behavior is also reported to be associated with physical activity. The implementation of programs involving physical activity in the communities of northern Manitoba was related to a 17% reduction in crime compared to a more than 10% increase in communities without the program (Winther & Curie, 1987). It was also found that participation in physical activities has a strong negative association with delinquent and

criminal behavior (Marsh, 1994). Effects may generalize and facilitate social interaction which would provide social support in times of increased demands.

Stress Management

Stress management is another active coping response which is an alternate method to stressor management as a means to achieve successful coping. Stress management is management of reactions. When one perceives a demanding situation to be unavoidable or unchangeable, an attempt to manage the reaction to the demanding situation can be initiated in order to reduce the potentially negative impact of the experience. Stress management affects a change in one's behavioral, cognitive, emotional, and physiological reaction to a demanding situation, instead of affecting a change in the situation or a change in one's resources to meet the situation.

Physiological stress management. Physiological reactions can be neutralized by use of techniques such as meditation, yoga, progressive relaxation, hypnosis, and exercise (Rosenthal, 1993). Meditation involves sitting quietly for 10 to 20 minutes twice a day. Many people find meditation helps them to relax and handle stress (Chalmers, 1989). Yoga is a systematic program of deep stretching and strengthening procedures coordinated with breath control which has been found to be effective in reducing physiological reactions to stressors (Funderburk, (1977). Progressive relaxation involves tightening and relaxing the major muscle groups one at a time while maintaining awareness of the sensation. Relaxation is an effective coping technique, useful in protecting people from the effects of stress. (Benson, 1975; Hiebert & Fitzsimmons, 1981; Jacobson, 1964). Hypnosis involves induction of a therapeutic trance to make stress reducing suggestions (Hammond, 1990). Hypnotherapy has proven effective in reducing

physiological activity in stressful situations (Omer, Darnel, Silberman, Shuval, & Palti, 1988).

Exercise can also be thought of as a stress management technique. Not only are physiological, cognitive, and social resources augmented through exercise, but emotional responses to stress seem to be moderated by physical fitness. Exercise has been found to have anti-depressant and anxiolytic effects (Martinsen, 1990; Morgan & O'Connor, 1987; Raglin, 1990). Folkins and Sime (1981) in their extensive review of the exercise/mental health literature found that in the majority of studies physical fitness tends to positively influence cognitive/emotional processes, work performance, a variety of clinical syndromes as well as personality traits. Tucker (1983) looked at the relationships among measures of obesity, exercise experience, somatotype and psychological health in undergraduate males aged 19-23 years old. He found that self-confidence, body satisfaction, extroversion, and emotional stability characterized the experienced exerciser and that men lacking exercise experience were depicted as under-confident, dissatisfied, introverted, and emotionally labile. Moderate aerobic conditioning has been found to generate positive mood changes over and above credible attention-placebo programs matched in all respects except for the activity component (Moses, Steptoe, Mathews, & Edwards, 1989). The anxiety reducing effect of exercise seems to have effects for up to 2 - 5 hours after participating in a session of exercise (Brown, Morgan, & Raglin, 1993). Compared to reductions in anxiety by using relaxation strategies, the anxiolytic effects of exercise appear to be longer lasting. Furthermore, Roth and Holmes (1987) found that subjects in an exercise training condition showed greater reductions in depressive symptomatology than subjects in a relaxation training condition.

Cognitive Stress Management. Other effective stress management coping strategies useful in the face of uncontrollable stressors are cognitive in nature (Zinbarg, Barlow, Brown, & Hertz, 1992). Thought stopping and thought substitution are effective coping mechanisms which can change one's reaction to a stressful situation. Reframing a situation by targeting negative cognitions and emphasizing positive aspects of the situation, using humor or self-talk to change emotional valence, or re-appraising the situation using a larger perspective or a larger time frame are all ways in which to facilitate positive self-talk and diminish self-defeating negative reactions to stressors. Behavioral reactions to stressful situations can also be counteracted. A common reaction to stressors often involves rushing. Hurried behavior can be equalized by intentionally slowing down: breathing slower, walking slower, eating slower, and taking short breaks (Hiebert, 1988).

Self-management. Another coping strategy that is highly effective in counteracting reactions to stressors is the engagement of self-management procedures. Self-management is the use of generalized techniques for behavioral adaptation and change (Kanfer, 1977; Mahoney, 1971; Rehm & Rokke, 1988). Individuals are instructed to observe their behavior, to explicitly formulate goals, to chart and evaluate progress, and to reward goal directed behavior. First, self-monitoring is used to observe one's behavior and the antecedents and consequences of the behavior as well as the interrelations among antecedents and consequences. Evidence shows self-monitoring can have a positive effect on perceived anxiety level (Hiebert & Fox, 1981). Next, self-evaluations are made by comparing one's performance with a criterion or goal. Judgments are thereby made as to whether the behavior did or did not meet the goal. Finally, reinforcement is self-

administered depending on a positive match between the behavior and the goal.

Reinforcement may be overt, such as allowing oneself a special outing, or it may be covert, such as feeling an internal sense of accomplishment. Self-reinforcement maintains behavior in the face of contradictory experience; such as, the sacrifice and temptations often experienced as part of the process of behavior change.

Modifying physiological, cognitive/emotional, and behavioral reactions to stressors in the above ways are highly constructive forms of coping which feed back into one's perception of the demanding situation in a positive manner to reduce stress. The more a coping strategy has a positive outcome, the more beneficial an impact it will have on one's transactional perception of the demands in a situation. Therefore, one would expect lifestyle education programs that teach and promote such behaviors to have a positive effect on people's sense of stress and daily hassles.

Effects of Lifestyle

Healthy active lifestyle behaviors are consistently associated with reduced stress and improved well-being. A survey of 2,800 Japanese factory workers indicated that keeping mental stress levels adequate, a nutritionally balanced diet, eating breakfast regularly, physical exercise 2 or more times per week, sleeping 7-8 hours per day, and working less than 10 hours per day were significantly negatively related to psychological distress, and symptoms of stress, such as insomnia and somatic complaints (Ezoe & Morimoto, 1994). Another survey of more than 3000 people from 58 different organizations suggested a strong relation between lifestyle and health habits on the one hand and psychosomatic distress, tension, and job satisfaction on the other hand (Steffy, Jones, & Noe, 1990). An Australian twin study of 4870 female and 2746 male twins

found that stress appears to play an important role in the development of hypertension but that lifestyle variables account for even more of the variance in hypertension than does environmental stress (Mellors, Boyle, & Roberts, 1994). A study of 133 workers from an educational institution suggests that poor nutritional habits are related to subjective measures of stress. The authors point out that, although poor nutritional habits may increase subjective feelings of stress, it may also be the case that subjective distress could lead to poor nutritional habits. The above surveys and correlational studies provide limited information as to the effect of lifestyle variables on perceived stress.

Lifestyle training programs seem to indicate that healthy lifestyle variables are not only related to but actually influence well-being. A campus health promotion program consisting of stress management techniques, aerobic exercise, interpersonal relationship skills, and nutrition was reported to have had a lasting positive impact on participants lives at 2 year follow-up (McClary, Pyeritz, Bruce, & Henshaw, 1992). In a 6-week stress-management program, delivered one-on-one to people in crisis, participants identified personal stress reactions, and they learned coping strategies related to nutrition, exercise, progressive relaxation, cognitive control, time management, applied the skills, and received personal feedback regarding the application of their new skills. The program was significantly effective in increasing self-esteem, and in decreasing depression and anxiety (Godbey & Courage, 1994).

Controlled research on the effects of combined lifestyle education and moderate exercise on perceived stress is severely limited, especially in normal populations of sedentary adults. Pelletier and Lutz (1991) reviewed the research on health education and stress management programs in the workplace and found only nine empirically rigorous

studies. Eight of the nine studies demonstrated clear efficacy in improving health with the remaining one study evidencing equivocal results. Only one of the studies demonstrated a direct positive effect on stress. None of the studies examined the differential effects of health education and exercise training on measures of stress.

Empirical validation of the combination of lifestyle education and exercise training and analysis of the differential effects of lifestyle education and exercise on perceived stress would be a useful contribution to the literature. There is a paucity of research that examines both education and exercise concomitantly. A recurring theme in the scientific literature is to investigate either the effects of lifestyle education on stress or the effects of exercise on stress but there is a need to research the combination of aerobic exercise training and lifestyle education on perceptions of stress. It would be valuable to investigate the relative effects of lifestyle education and exercise training on perceived stress to further understand the differential contributions of exercise training and healthy lifestyle education to the alleviation of stress.

Mixed Results of Exercise Programs

The effects of exercise on perceived stress and psychological well-being are generally positive and have been reviewed above; however, there are some mixed results of the effects of fitness on psychosocial factors which indicates a need for further research. One study (Stern & Cleary, 1982) of 651 men who suffered from myocardial infarction were randomly assigned to an exercise program or a control group. No differences were noted between exercise and control groups on psychosocial variables. Furthermore, a review of controlled experiments (Hughes, 1984) indicates that habitual aerobic exercise produces mixed results as to its effect on anxiety. In an experimental

study by the same author (Hughes, Casal, & Leon, 1986) it was found that exercise did not improve anger, anxiety, confusion, fatigue, vigor, or total mood disturbance. In the above studies exercise training occurred for each participant individually while other participants were not present. It is, therefore, not clear whether positive changes in psychological well-being are the result of participation in training groups or due to the effects of fitness per se. Long (1983) found that changes on measures of stress do not appear to be due to increases in aerobic power, nor are higher initial levels of fitness associated with less self-reported stress. She suggests that the psychosocial aspect of fitness programs may be the active ingredient of treatment and that participation per se and not increased fitness levels reduce self-reported stress.

Other studies demonstrate that it is not physical fitness per se that has positive effects on mood, but simply physical activity. Aganoff and Boyle (1994) in a study of self-selected female exercisers and non-exercisers aged 15-48 years old found that women who exercise regularly, regardless of fitness level, report less negative affect, increased positive affect, and lower levels of physical symptoms throughout the menstrual cycle. Berger and Owen (1983) conducted a 14 week self-selection exercise program for women and men aged 17-50 years old. They found that the psychological effects of swimming were not more pronounced for those performing strenuous exercise than for leisurely paced swimming. In both cases swimmers reported significantly less tension, dejection, confusion, and hostility, as well as more vigor after exercising. Furthermore, it does not appear to be necessary to participate in long-term physical training to receive some of the stress reducing benefits of exercise (Crocker & Grozelle, 1991). In fact,

Moses et al. (1989) in a controlled trial found that moderate levels of physical activity were more effective in enhancing mental well-being than high intensity aerobic training.

A change in fitness may not necessarily imply a concomitant change in the subjective experience of stress. De Geus, Van Doornen, and Orlebeke(1993) found evidence that a change in fitness is not a sufficient condition for a change in psychological status. Roy and Steptoe (1991) randomly assigned male students aged 19-23 years to one of three exercise groups: high intensity, low intensity or no-exercise control. They found that cardiovascular reactivity to stress was suppressed in subjects who had recently exercised, however none of the self-report measures of tension under pressure differed across groups; therefore, the subjective experience of stress was not altered even when there was physiological evidence that reactivity to stressors had changed due to recent exercise. Further evidence in another study by Steptoe, Moses, Edwards, Edwards, and Mathews (1993) found reduced cardiovascular reactivity to stress following exercise, but no accompanying modifications in subjective experience.

Roth (1989) also found that mood was significantly altered by a single bout of aerobic activity even in the absence of changes in physiological reactivity. Holmes and Roth (1985) looked at the association between high and low fit female undergraduate students and response to stress. They found that a high level of aerobic fitness was associated with reduced physiological reactivity to psychological stress. The high fit subjects had a smaller pulse rate response to stress than did the low fit subjects which was explained in terms of a heart rate response with greater stroke volume rather than more strokes. However, high and low fit subjects did not differ in their subjective

responses to stress. Therefore, differential physiological response was not sufficient to influence subjective experience.

In a non-experimental, 13 week program of aerobic exercise involving women aged 17-20 years old, Holmes and McGilley (1987) also found that training decreased subjects' heart rates during the stressor, but did not decrease their reported subjective arousal. A simple change in physical fitness does not seem sufficient to alter psychological status (De Geus et al., 1993).

The research studies on fitness and stress are difficult to generalize to a mixed population of persons who can be characterized on demographic variables which range in age, gender, lifestyle, physiological and psychological attributes. Research has tended to study homogenous groups of individuals who are usually privileged, athletic, college men in there twenties (Crocker & Grozelle, 1991; Light et al., 1987; Roth, 1989; Roth & Holmes, 1987; Roy & Steptoe, 1991; Sothmann, Hart, & Horn 1992; Steptoe et al., 1993; Tucker, 1983).

Research Questions

The most important scientific contributions of the present study were to collect empirical evidence for the validation of the effects of exercise and lifestyle education on subjective experiences of stress as well as to examine the effect of physiological fitness on stress in a diverse group of middle aged, working class individuals. To help identify the active ingredients in lifestyle education programs the following research questions needed to be addressed: 1) What are the relative effects of healthy lifestyle education and aerobic exercise training on perceived levels of stress? 2) Do participants who show high fitness have differential levels of perceived stress over a 12 week program of lifestyle

education and/or fitness training compared to participants with low fitness? 3) Do high stress participants have differential levels of fitness compared to low stress participants?

Chapter 3: Method

The present research study was a replication and extension of a stress and fitness study completed earlier (Malec & Hiebert 1997). The purpose of the replication was to track people as they exercise and/or become more educated about healthy lifestyle in order to further understand how lifestyle education, fitness, and stress inter-dependently vary. It was also the purpose of the study to evaluate the effectiveness of the expanded, holistic version of a healthy lifestyle program. The study was an outcome study and was not designed to evaluate the underlying processes responsible for the change in stress or fitness. In the present study, investigations were limited to the relative effects of aerobic exercise training and healthy active lifestyle education on perceived stress and the differential effect of high and low fitness on perceived stress.

Participants

Participants were recruited through an extensive advertising campaign. Notices requesting participation in a stress and fitness study were distributed at fitness stores, health food stores, grocery stores, mountaineering stores, the planetarium, retirement community centers, on the Internet at a city events address, and over business e-mail at a large petrochemical corporation. Newspaper advertising was also employed asking for “couch potatoes” to participate in a stress and fitness study. The notices described an opportunity to become involved in real world research, to increase power to cope with stress, and to become more physically fit. Incentives to participate included partaking in an important research study on the effects of fitness and lifestyle education, participation in a low-impact moderate exercise training program conducted by modest fitness instructors, healthy lifestyle education training, and individual participant results of

fitness, lifestyle education, and stress. Program costs were carried by participants but there was a monetary incentive available for individuals completing all assessment points.

Sixty-seven participants were recruited and self-selected into one of the four treatment groups. There were 41 participants in the lifestyle education and exercise combined group, 8 participants in the exercise only group, 6 participants in the education only group, and 12 participants in a wait-list control group. Four people withdrew from the combined education and exercise program, and 1 person withdrew from the wait-list control group due to time commitments, leaving a total of 62 participants in the study: 37 in the combination group, 8 in the exercise group, 6 in the education group, and 11 in the control group (see Table 1).

Table 1

Attrition Across Time

Group	Time							
	1		2		3		4	
	<u>Gender</u>		<u>Gender</u>		<u>Gender</u>		<u>Gender</u>	
	F	M	F	M	F	M	F	M
Combined	24	17	24	17	23	16	22	15
Exercise	4	4	4	4	4	4	4	4
Education	3	3	3	3	3	3	3	3
Wait List	6	6	5	6	5	6	5	6
Total	67		66		64		62	

The attrition rate was, therefore, a remarkably low 9%. Dishman, (1988) found a drop-out rate of approximately 50% in the first 6 months of supervised exercise programs. However, because the present study provided monetary incentive to complete the programs, this may have contributed significantly to the high retention rate. Although providing rebates to complete the programs may not reflect real-life circumstances, for the purposes of determining relative effectiveness of treatment conditions maximizing program completion was desirable.

The sample consisted of 33 women and 29 men. The participants ranged in age from 27 to 71 years old, with a mean age of 45 years. Over 85% of the sample described themselves as Caucasian, 11% Asian, 2% Chicano, and 2% Native American Indian (see Table 2). Marital status consisted of 9% single, 3% cohabiting, 71% married, 3% separated, 9% divorced, and 3% widowed. Living arrangements consisted of 19% living on their own, 74% living with a spouse or significant other, 3% living with roommates, and 3% living with parents (see Table 3). Size of immediate family was such that 26% had no children, 43% had 2 children or less, 31% had more than 2 children, and no one was expecting a child (see Table 4). More than 85% of the sample used alcohol, 84% used caffeine, and 11% used tobacco (see Table 5). There were 5 people unemployed with 40 hours per week as the most common number of hours worked; hours worked ranged from 0 to 72 per week. The mean number of years of schooling was 15.36; years of schooling ranged from 9 to 19 years (see Table 6). The most common educational degree completed was a university bachelor's degree.

Table 2

Ethnicity by Group

Group	Ethnicity				Total
	Caucasian	Asian	Chicano	Native American	
Combined	31	4	1	1	37
Exercise	0	8	0	0	8
Education	5	1	0	0	6
Wait List	9	2	0	0	11
Total	45	15	1	1	62

Table 3

Living Arrangements by Group

Group	Living Arrangements				Total
	Alone	With Spouse	With Roommates	With Parents	
Combined	7	28	1	1	37
Exercise	1	7	0	0	8
Education	1	5	0	0	6
Wait List	3	6	1	1	11
Total	12	46	2	2	62

Table 4

Number of Children by Group

Group	Children				Total
	None	2 or Less	More than 2	Expecting	
Combined	11	13	13	0	37
Exercise	0	4	4	0	8
Education	3	3	0	0	6
Wait List	2	7	2	0	11
Total	16	27	19	0	62

Table 5

Substance Use by Group

Group	Substance			Total
	Alcohol Use	Caffeine Use	Tobacco Use	
Combined	31	32	5	37
Exercise	7	5	1	8
Education	6	5	0	6
Wait List	9	10	1	11
Total	53	52	7	62

Table 6

Mean Age, Years Schooling, and Hours Worked per Week

Group	Mean Age	Mean Years Schooling	Mean Hours Work per Week
Combined	44.43	15.62	43.43
Exercise	48.88	15.75	46.00
Education	42.83	15.33	50.00
Wait List	45.36	14.73	23.73
Total	45.38	15.36	40.79

Procedure

Individuals selected to participate in one of four treatment groups. Practically speaking, random assignment of individuals to different treatment conditions was not feasible. However, people would not randomly assign to different treatment conditions in natural settings. Therefore, the results of the present study may generalize more readily to real world populations seeking treatment.

The first treatment program offered education in healthy active lifestyle along with the aerobic fitness training. The second treatment program offered aerobic fitness training only. A third program offered the lifestyle change program alone. And the final group was a waiting list control group for those individuals who prefer to participate in the study at a later date.

The healthy active lifestyle education program (Malec et al., 1997) consisted of several components (see Appendix D). The program covered the following lifestyle areas:

personal and time management skills to help people maintain balance in their lives; stress management techniques, such as relaxation training and development of positive self-talk; nutrition education; skills for managing change; general health practices; and aerobic fitness training. Participants were provided with a take-home manual which gave week by week education in the above areas. At the end of each weekly chapter there were homework assignments to help participants to consolidate information they had gained, to clarify their goals, and to chart their progress. Classes were held for 1 hour once a week for 12 weeks.

The lifestyle education program was administered by a team of registered nurses, registered fitness instructors, psychologists, and dietitians. The program offered guidance in the form of presentation, demonstration and group discussion. Participants learned behaviors, knowledge and skills necessary to modify their lifestyle and to promote health and well-being. The program was originally designed as a lifestyle program for weight control. For the purposes of the present study, the program was developed into a broader healthy active lifestyle program based on the original program but taking a more holistic approach. In this way, the original program was expanded to meet the needs of a greater number of people who could benefit from developing a more healthy active lifestyle.

The aerobic fitness program was offered by trained fitness instructors. The exercise program was conducted for 50 minutes, twice a week for the duration of the 12 week study. Physical activity included warm-up and cool down periods along with 30 minutes of low-impact moderate aerobic-dance exercise.

The waiting list control group consisted of individuals who were interested in the research project but preferred to participate in a program at a later date. The wait-list

group was not contacted other than to monitor the dependent measures. Therefore, it was not possible to control for the effect of participating in a group that meets every week for the 12 week duration of the study. Alternatively, an attention control could have been used, but any form of attention is probably not inert with regards to its impact on stress. Meeting regularly in a group may have an effect on stress because research has shown that social support is an excellent resiliency factor and a strong health promoting behavior (Sobel, Valente, Munice, Levine, & Deforge, 1985). However, the wait-list group does control for time tied effects; such as the possibility that the treatment groups could become more physically fit or less stressed due to seasonal changes.

The amount of time the combined treatment group had contact with instructors and with one another was greater than for the education group which was greater than for the exercise group which was greater than for the wait list control. The combined group met for 3 hours per week, the exercise group met for 2 hours per week, the education group met for 1 hour per week and the wait list group met only at the testing sessions which took 1 hour per month. Because any kind of attention can be considered to have an effect, attention placebo was not used in the present study. The matter of contact time as a confound will be addressed in the discussion in terms of the proposed mechanisms or processes through which treatments achieved change.

Participant stress levels and fitness levels were assessed at the onset of the program for baseline statistics and once every 4 weeks thereafter for the duration of the 12 weeks, resulting in a total of four repeated measurements of stress level and four repeated measures of fitness level. The dependent measures of stress included Symptoms of Stress Inventory, and the Daily Hassles Scale, and fitness measures included morning

resting heart rate, distance traveled in a modified version of the Cooper fitness test.

Programs were held at two different sites. Participants were tested at the same site as where their program was being held.

Dependent Measures

The demonstrated value of the lifestyle program was examined using tests and measures that were embedded within the administration of the program. A review of the literature revealed that there were reliable and valid instruments available for measuring stress and fitness levels. Based on this research, levels of stress were measured using two questionnaires: the Daily Hassles Scale, and the Symptoms of Stress Inventory.

Confidentiality was explained to participants and ensured both for ethical reasons and in order to maximize the honesty of information provided (see Appendix A). Fitness levels were measured using resting morning heart rate and a modification of the Cooper fitness test (Cooper, 1970; Cooper, Purdy, White, Pollock, & Linnerud, 1975) which consisted of distance traveled around a running track in a 12 minute period. Finally, amount and type of aerobic exercise completed outside any program requirements was tracked for each individual in order to establish baseline aerobic activity.

Stress Measures

Daily Hassles Scale. The Daily Hassles Scale (Kanner, Coyne, Schaefer, & Lazarus, 1981) is a 117 item self-report questionnaire covering a diversity of everyday minor stressors that may occur in a person's life (see Appendix B). The variety of potential events covered permits for differing constellations of stressful events across individuals, depending on particular interpersonal and social contexts. For example, questions are asked regarding concerns about weight, transportation problems, personal

use of drugs, social obligations and troublesome neighbors. Responses indicate the occurrence of the stressful event within the last 2 weeks as well as the severity of hassle experienced in conjunction with the event.

Participants respond using a four point Likert scale stem ranging from none or did not occur to extremely severe. In the original study (Malec & Hiebert, 1997) participants found it difficult to use the Likert scale system to answer questions on the Daily Hassles Scale due to the emphasis on severity of experience. However, the stem was not changed for the present study because an improved scale would not have had the same body of normative data nor the same extent of reliability and validity data. We retain the original format for purposes of normative comparisons and to stay faithful in attempt at replication. The scale has a high test-retest reliability of $r = .79$ for frequency and an $r = .48$ for intensity (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982). Frequency of Daily Hassles is significantly correlated with stress symptom levels both in the initial and final stages, with correlations of $r = .27$, $p < .01$, and $r = .35$, $p < .01$ respectively. Subjects who have high frequency of hassles are found to have relatively high levels of somatic symptoms of stress (DeLongis et al., 1982).

Empirical research indicates that daily hassles are better predictors of psychological symptoms than major life events (Camberlain & Zika, 1990; Dohrenwend, & Shrout, 1985). There is a consistently high association of hassles to decreased mental health and well-being. The index of daily hassles proves to be a better predictor of psychological and physical symptoms than life events (Burks & Martin, 1985; Brosschot et al., 1994; DeLongis et al., 1982; Kanner et al., 1981; Monroe, 1983; Reich, Parella, & Filstead, 1988; Stone, Reed, & Neale, 1987; Weinberger, Hiner, & Tierney, 1987; Zarski,

1984). Furthermore, it has been postulated that minor everyday events have a cumulative effect greater than infrequently occurring discrete major events (Brosschot et al., 1994) and that daily hassles have a greater impact on the immune systems (Herbert & Cohen, 1993). Whereas life events are objective phenomena, daily hassles are subject to individual interpretation (Camberlain & Zika, 1990). As such, a daily hassles index accounts for individual variation in the interpretation of events. For example, where one person may experience the occurrence of silly practical mistakes as extremely frustrating and stressful another individual may experience the same event but feel no distress. The Daily Hassles Scale has many items rated by clinical psychologists as probable symptoms of psychological disorder (Dohrenwend, Dohrenwend, Dodson, & Shrout, 1984), for example, trouble relaxing, thoughts about death, nightmares and fear of confrontation. However, when items resembling psychiatric symptoms are removed, the scale continues to be a better predictor of psychological well-being than indices of major life events (Landerville & Vezina, 1992).

Symptoms of Stress Inventory. The Symptoms of Stress Inventory (Leckie & Thompson, 1979) is a 95 item self-report questionnaire (see Appendix C). Questions about symptoms of stress include areas such as headaches, rapid breathing, muscle tension, worrying, frightening thoughts or dreams and symptoms of depression. Responses are indicated using a five point Likert scale ranging from never to very frequently. Demographic information was also collected in this questionnaire; such as, marital status, education, ethnic background and employment.

The Symptoms of Stress Inventory is reported to be a reliable and valid measure of stress level. Reported face validity is high for the Symptoms of Stress Inventory, and

the reliability using Chronbach's alpha ranges from .71 to .87 for the subscales, and is .96 for the full scale score (Hiebert & Eby, 1985). Leckie and Thompson (1979) report a correlation of $r = .82$ with the Symptom Checklist-90-R which is a standardized test that has high levels of both internal consistency and test-retest reliability and coefficient alphas between .77 and .90. Internal consistency is reported as .97 (Cronbach's alpha).

Fitness Measures

Based on the recommendations of trainers and researchers at the human performance lab at the University of Calgary in the faculties of Kinesiology and Medicine, the following dependent measures, which attest to fitness, were chosen based on their reported reliability and validity: morning resting heart rate, the Cooper Fitness Test (Cooper et al., 1975) modified for self-selected effort. As fitness improves it is expected that morning resting heart rate will decrease, and distance traveled in the 12 minute Cooper fitness test will increase.

Morning resting heart rate. Resting heart rate is an index of physiological efficiency and overall fitness. Self-monitored resting heart rate was recorded by participants upon rising for 7 consecutive days immediately prior to each assessment interval. Pulse was counted for 1 minute. Each participant received a demonstration and instruction on how to take their pulse as well as a booklet to record the figures. Significant correlations have been observed between self-monitored and externally monitored measures of heart rate (Jamieson, Flood, & Lavoie, 1989; Steptoe, Kearsley, & Walters, 1993).

Cooper fitness test. The Cooper fitness test was also used as a measure of physical fitness (Cooper, 1970; Cooper et al., 1975). This test required participants to exert

themselves for the duration of a 12 minute walk or run. Due to ethical considerations, and because the sample consisted of many sedentary people, participants personally decided the amount of effort they wished to exert and were not asked to give maximum effort. Participants were asked to move continually around an indoor running track for the duration of 12 minutes. Number of completed laps was recorded after the 12 minute period. This test is reported to be an excellent measure of aerobic fitness (Sharkey, 1979). Criticisms could be leveled for using exercise distance as a measure of fitness at sub-maximal workloads, but it was not possible to conduct a maximal test within the ethical constraints of this study. Laps completed by either running or walking were recorded by the participant with a small pencil on masking tape attached to their arm. The final lap was recorded in units of $1/4^{\text{th}}$ of a lap at the end of 12 minutes. Verification of accuracy was maintained by random recordings done by research assistants and researchers. The researchers' recorded lap times were verified against participant reported laps.

Chapter 4: Results

Design

In order to empirically evaluate the programs, the data was analyzed in a 4 X 4 (treatment group X time), repeated measures over time, MANOVA. Levels of treatment included combined fitness training and lifestyle education, physical fitness training alone, healthy lifestyle education alone, and waiting list control. The four levels of treatment were analyzed at four time points. The following comparisons were planned on the between groups factor in case there was a main effect for group: 1) the combination group versus each of the other 3 groups, 2) each single treatment, that is, exercise and education, versus the wait list control, 3) the exercise group versus the education group, and 4) the average of the 3 treatment groups versus the wait-list control; that is, any treatment versus no treatment. In case there was a main effect for time the following comparisons were planned: 1) time one versus time two, 2) time two versus time three, and 3) time three versus time four, 4) time 1 versus time 4, and in case it was significant 5) time 2 versus time 4. If the interaction between group and time was significant, such that the effect of one factor differed at levels of the other, the simple main effects would be investigated and where there were significant simple effects specific comparisons would be made as above but at particular levels of each factor.

To address questions about whether fitness affects perceived stress and daily hassles, the sample was divided into high and low fitness by making a median split on each of the fitness measures at baseline, before the treatments began. Participants below the median on morning resting heart rate were grouped as high fit and those above the median grouped as low fit. Similarly, a median split on meters traveled in 12 minutes was

used to create groups of high and low fit participants. Those people above the median were grouped as high fit and those below as low fit. Both high fit and low fit group differences were then analyzed on each of the stress measures using 2 X 4 (fitness level X time), repeated measures ANOVAs.

Finally, in order to address the question of whether stress and daily hassles has an effect on fitness, the sample was divided into high and low stress by making a median split on Symptoms of Stress scores and Daily Hassles scores at baseline. High and low stress groups were then compared on resting heart rate and distance traveled using repeated measures ANOVA's.

Data Screen

Homogeneity of Variance. Tests for homogeneity of variance were performed on the dependent measures using the Cochran's C test for each variable individually at each testing time (see Table 7). Eight out of 16 cells were found to have homogeneity of variance across the grouping variable.

The variability of the Daily Hassles scores at time 3 and time 4 was significantly different across levels of the grouping variable, variability of scores on the Symptoms of Stress Inventory were significantly different across groups at time 2 and time 4, variability of distance traveled in 12 minutes was different across groups at all 4 measurement times. However, variability in morning resting heart rates was about the same at all levels of the grouping variable at each measurement time. Therefore, the assumption of homogeneity of variance was satisfied for the resting heart rate measure of fitness.

Table 7

Cochrans C

Measures	Time			
	0 weeks	4 weeks	8 weeks	12 weeks
Daily Hassles Scale	$\underline{C} (14, 4) = .37$ $p = .31$	$\underline{C} (14, 4) = .37$ $p = .31$	$\underline{C} (14, 4) = .47$ $p = .03$	$\underline{C} (14, 4) = .53$ $p = .00$
Symptoms of Stress Inventory	$\underline{C} (14, 4) = .32$ $p = .75$	$\underline{C} (14, 4) = .45$ $p = .05$	$\underline{C} (14, 4) = .36$ $p = .41$	$\underline{C} (14, 4) = .53$ $p = .00$
Distance Traveled	$\underline{C} (14, 4) = .46$ $p = .04$	$\underline{C} (14, 4) = .56$ $p = .00$	$\underline{C} (14, 4) = .53$ $p = .00$	$\underline{C} (14, 4) = .46$ $p = .04$
Resting Heart Rate	$\underline{C} (14, 4) = .31$ $p = .87$	$\underline{C} (14, 4) = .35$ $p = .50$	$\underline{C} (14, 4) = .32$ $p = .79$	$\underline{C} (14, 4) = .32$ $p = .32$

Collinearity. Bivariate correlations were run on the dependent measures of stress and the dependent measures of fitness to evaluate the potential for multicollinearity. Results indicated that the Symptoms of Stress Inventory and the Daily Hassles Scale were moderately correlated at time 1 ($r = .70$) and more highly correlated at times 2, 3, and 4 ($r = .89$, $r = .91$, $r = .91$, respectively). The stress measures were not entirely redundant as they each accessed some unique information. Distance traveled in 12 minutes and morning resting heart rate as measures of fitness were found to have a low correlation at times 1, 2, 3, and 4 ($r = -.29$, $r = -.23$, $r = -.31$, $r = -.20$, respectively). Therefore, the measures of fitness were not found to be multicollinear.

Normality. The kurtosis and skew of each dependent variable was examined at each measurement time to check for normality (see Table 8).

Table 8

Skewness and Kurtosis Values of Dependent Variables over Time

Measure	Time			
	0 weeks	4 weeks	8 weeks	12 weeks
Daily Hassles Scale	skew = .85	skew = 1.66	skew = 2.08	skew = 2.61
	kurtosis = .62	kurtosis = 2.74	kurtosis = 5.98	kurtosis = 8.86
Symptoms of Stress Inventory	skew = .63	skew = 1.79	skew = 1.79	skew = 2.22
	kurtosis = -.19	kurtosis = 4.05	kurtosis = 3.57	kurtosis = 6.07
Distance Traveled	skew = 1.07	skew = .83	skew = .79	skew = .52
	kurtosis = .43	kurtosis = .69	kurtosis = 1.11	kurtosis = .02
Resting Heart Rate	skewness = -.11	skewness = -.40	skewness = .17	skewness = .15
	kurtosis = .48	kurtosis = .73	kurtosis = .00	kurtosis = .69

When a distribution is normal the values of skewness and kurtosis are approximately between 1 and -1. Therefore, on the Daily Hassles Scale and on the Symptoms of Stress Inventory, at times 2, 3, and 4 there was a disproportionate number of people with scores at the low end of the distribution and the distribution was too peaked to be normal. Distance traveled and resting heart rate, however, appeared to have normal distributions at all 4 testing times.

A square root transformation of the scores on the stress measures was performed to correct for the positive skew and the positive kurtosis as well as to improve the homogeneity of variance (see Tables 9 & 10).

Table 9

Skewness and Kurtosis Values for the Transformed Stress Variables

Measure	Time			
	0 Weeks	4 weeks	8 weeks	12 weeks
Daily Hassles Scale	skew = $-.30$	skew = $.31$	skew = $.41$	skew = $.73$
	kurtosis = $.24$	kurtosis = $-.09$	kurtosis = $-.22$	kurtosis = $.02$
Symptoms of Stress Inventory	skew = $.04$	skew = $.30$	skew = $.58$	skew = $.65$
	kurtosis = $-.49$	kurtosis = $-.65$	kurtosis = $-.001$	kurtosis = $.09$

After transformation of the stress variables not only was the normality of the stress variables improved but also the homogeneity of variance was improved with none of the time points showing significant heterogeneity of variance across groups. This is important because the more discrepant group sizes, the more important is the assumption of homogeneity of variance.

Table 10

Cochrans C on the Transformed Stress Variables

Measure	Time			
	0 weeks	4 weeks	8 weeks	12 weeks
Daily Hassles Scale	$\underline{C} (14, 4) = .34$ $p = .55$	$\underline{C} (14, 4) = .31$ $p = .83$	$\underline{C} (14, 4) = .42$ $p = .11$	$\underline{C} (14, 4) = .41$ $p = .13$
Symptoms of Stress Inventory	$\underline{C} (14, 4) = .31$ $p = .14$	$\underline{C} (14, 4) = .37$ $p = .32$	$\underline{C} (14, 4) = .32$ $p = .77$	$\underline{C} (14, 4) = .44$ $p = .06$

Multivariate Outliers. Mahalanobis distance was computed for each case at each measurement time in order to screen for multivariate outliers. Multivariate outliers are cases with an unusual combination of scores on the dependent variables. Mahalanobis distance is the distance of a case from the centroid of the remaining cases where the centroid is the point created by the means of all the variables (Tabachnick & Fidell, 1996). One case was found to be a multivariate outlier at time 2, time 3 and time 4, respectively ($\chi^2 (4, N = 62) = 18.93, p < .001$; $\chi^2 (4, N = 62) = 20.59, p < .001$; $\chi^2 (4, N = 62) = 24.97, p < .001$), and was deleted from the sample. The case was a 55 year old female in the combined lifestyle education and exercise group. She expressed, several times throughout the study, her dismay, disinterest, and disregard of the program and of her participation in the study. She had stated that the reason she continued was so that she could qualify for the financial rebate upon completion of the study. There were many undue acute environmental stressors that she was affected by during the 12 week course

of the program: death of spouse, housing relocation, and economic problems. Deletion of the case may limit generalizability of the results to a population of individuals with less acute and more moderate environmental stressors. There were no other outlying cases, therefore, $N = 61$. Removal of the multivariate outlier did not create homogeneity of variance on the dependent measures; therefore, caution should be exercised in drawing reliable conclusions from the statistical results.

Group Comparability

Separate chi-square tests of independence were conducted to examine treatment group equivalencies on demographic variables. There were no significant differences among the groups on age ($F(3, 57) = .84, p = .48$), sex ($\chi^2(3, N = 61) = .51, p = .92$), tobacco use ($\chi^2(6, N = 61) = 4.83, p = .56$), caffeine use ($\chi^2(6, N = 61) = 7.36, p = .29$), alcohol use ($\chi^2(15, N = 61) = 20.34, p = .16$), level of education ($\chi^2(24, N = 61) = 31.91, p = .13$), marital status ($\chi^2(15, N = 61) = 10.77, p = .77$), number of children ($\chi^2(6, N = 61) = 9.27, p = .16$), living arrangements ($\chi^2(9, N = 61) = 4.73, p = .86$), or ethnicity ($\chi^2(9, N = 61) = 3.11, p = .96$). Number of hours worked per week, however, was significantly different between groups ($F(3, 57) = 8.47, p < .01$) and was, therefore, used as a covariate in the main analysis (see Table 11).

The power of the covariate to make a significant adjustment to the dependent variables was examined. Multiple regressions were run for each testing time. Number of hours worked per week was not a significant covariate when adjusting the dependent measures at time 1, 2, 3, or 4 ($t(56) = -1.04, p = .30$; $t(56) = -.20, p = .85$; $t(56) = 1.00, p = .32$; $t(56) = -.95, p = .34$; respectively). Because number of hours worked per week

provided no adjustment at any of the time points, it was eliminated as a covariate from the rest of the analysis.

Table 11

Hours Worked Per Week by Group

	Hours Worked per Week			
	Mean	<u>SD</u>	Range	<u>n</u>
Combined	43.43	11.55	0 - 72	36
Exercise	46.00	7.62	40 - 60	8
Education	50.00	5.48	45 - 60	6
Wait List	23.73	20.47	0 - 50	11

One-way ANOVAS were performed on the dependent measures across groups at time 1 on all participants who still remained in the study at time 4, in order to evaluate the group equivalencies on the dependent measures at baseline. Significant differences between groups were not detected in scores on the Daily Hassles Scale ($F(3, 57) = 1.79$, $p = .16$), or the morning resting heart rate ($F(3, 57) = .57$, $p = .64$). Therefore, groups were equivalent pre-treatment on these dependent measures. However, there were significant differences between groups on meters traveled in 12 minutes ($F(3, 57) = 3.26$, $p = .03$), with the education group traveling the furthest (see Table 12) and on Symptoms of Stress scores ($F(3, 57) = 3.27$, $p < .05$) with the exercise group having the lowest average Symptoms of Stress (see Table 13).

Table 12

Distance Traveled at Baseline Across Groups

Group	Mean Meters Traveled in 12 min.	<u>SD</u>	Range	<u>n</u>
Combined	1374.13	254.18	1062.50 - 2031.25	36
Exercise	1399.22	238.42	1125.00 - 1762.00	8
Education	1781.25	395.78	1281.25 - 2093.75	6
Wait List	1550.57	487.42	1000.00 - 2375.00	11

Table 13

Symptoms of Stress Scores at Baseline Across Groups

Group	Mean Symptoms of Stress Scores	<u>SD</u>	Range	<u>n</u>
Combined	92.25	51.80	15 - 221	36
Exercise	41.00	26.93	6 - 83	8
Education	85.67	49.09	27 - 169	6
Wait List	91.36	50.42	17 - 163	11

MANOVA

In order to answer the first research question regarding the relative effects of the lifestyle education and aerobic fitness programs on stress BMDP4V was used for the analysis of group means. Pillai's trace was used as the criterion for evaluating multivariate differences. Significance level based on Pillai's trace is reasonably correct

even with unequal cell sizes (Olsen, 1976). The following group means were found at each of the 4 testing times on the Daily Hassles Scale (DHS), the Symptoms of Stress Inventory (SSI) (see Table 14), morning resting heart rate (RHR), and meters traveled in 12 minutes (Meters) (see Table 15).

Table 14

Group Means and Standard Deviations of Daily Hassles Scores

	Time				
Measure/Group	0 weeks	4 weeks	8 weeks	12 weeks	Total
Daily Hassles					
Combined	46.67 (27.07)	34.53 (25.69)	27.81 (23.86)	17.14 (20.39)	31.53 (26.41)
Exercise	26.13 (14.91)	16.38 (13.98)	12.88 (10.20)	9.50 (5.98)	16.22 (12.88)
Education	33.00 (23.24)	26.00 (19.19)	23.00 (20.07)	23.17 (20.49)	26.29 (19.84)
Wait List	41.91 (21.91)	41.27 (26.90)	40.45 (30.75)	37.36 (31.58)	40.25 (27.11)
Total	41.77 (25.16)	32.52 (24.79)	27.66 (24.43)	20.38 (22.88)	30.58 (25.40)

Table 15

Group Means and Standard Deviations of Symptoms of Stress Scores

	Time				
Measure/Group	0 weeks	4 weeks	8 weeks	12 weeks	Total
Symptoms of Stress					
Combined	92.25 (51.80)	57.42 (39.58)	49.56 (44.17)	34.44 (35.31)	58.42 (47.70)
Exercise	41.00 (26.92)	26.63 (25.11)	21.13 (20.68)	22.25 (18.81)	27.75 (23.39)
Education	85.67 (49.09)	57.50 (35.51)	58.00 (50.09)	35.67 (27.65)	59.21 (42.87)
Wait List	91.36 (50.42)	78.73 (53.56)	74.73 (46.29)	70.64 (52.14)	78.86 (49.51)
Total	84.72 (50.71)	57.23 (42.19)	51.20 (44.52)	39.49 (38.98)	58.16 (47.08)

Table 16

Group Means and Standard Deviations of Resting Heart Rate

	Time				
Measure/Group	0 weeks	4 weeks	8 weeks	12 weeks	Total
Resting Heart Rate					
Combined	65.42 (8.67)	64.38 (8.19)	63.66 (8.78)	62.48 (8.70)	63.98 (8.21)
Exercise	63.75 (7.09)	62.56 (6.67)	60.61 (8.30)	58.97 (7.67)	61.47 (7.38)
Education	61.49 (6.68)	61.71 (6.33)	60.76 (5.82)	61.76 (4.27)	61.43 (5.51)
Wait List	62.86 (8.43)	62.66 (8.94)	62.40 (9.16)	60.57 (9.47)	62.12 (8.68)
Total	64.35 (8.20)	63.57 (7.88)	62.75 (8.45)	61.60 (8.31)	63.98 (8.56)

Table 17

Group Means and Standard Deviations of Distance Traveled

Measure/Group	Time				Total
	0 weeks	4 weeks	8 weeks	12 weeks	
Distance Traveled in Meters					
Combined	1374.13 (254.18)	1385.07 (312.57)	1451.22 (334.59)	1513.02 (347.48)	1430.86 (315.94)
Exercise	1399.22 (238.42)	1434.38 (207.58)	1530.47 (268.73)	1547.66 (314.00)	1477.93 (255.33)
Education	1781.25 (395.78)	1807.29 (339.13)	1765.63 (380.56)	1947.92 (359.40)	1825.52 (352.22)
Wait List	1550.57 (487.42)	1702.27 (566.89)	1769.89 (616.55)	1701.70 (539.97)	1681.11 (541.10)
Total	1449.28 (337.03)	1490.27 (387.96)	1550.00 (410.57)	1594.36 (400.21)	1521.00 (386.00)

The unequal sample sizes were dealt with by the multiple regression method in order to value all cells as equally important. Each main effect and the interaction was assessed after adjustment was made for all other main effects and the interaction. Each cell was thereby given equal weight regardless of its sample size. The multiple regression method is the recommended approach for experimental research (Tabachnick & Fidell, 1996).

Mean differences in a linear combination of the stress and fitness variables at different levels of the grouping variable were not significantly larger than expected by chance ($F(12, 168) = 1.62, p = .09$); therefore, there was no main effect of group. Mean

differences in the composite dependent variable across time, however, were significantly larger than expected by chance ($F(12, 510) = 7.81, p < .01$); therefore there was a main effect of time. However, the main effects were not interpreted because there was also a significant interaction of time and group ($F(36, 684) = 1.88, p = .01$).

First, it needed to be determined which of the dependent measures showed significant group by time interaction. Follow-up univariate tests indicated a significant change in the Daily Hassles scores ($F(9, 171) = 3.27, p < .01$) and the Symptoms of Stress scores ($F(9, 171) = 2.73, p < .01$); but no significant change in the number of meters traveled in 12 minutes ($F(9, 171) = 1.64, p = .11$) nor the morning resting heart rate ($F(9, 171) = .92, p = .51$).

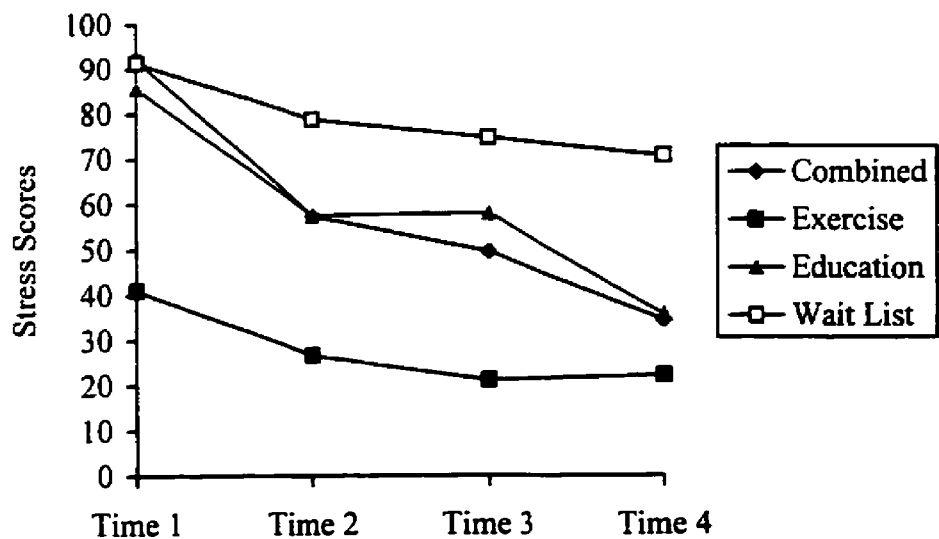


Figure 1. Symptoms of Stress scores for groups across time.

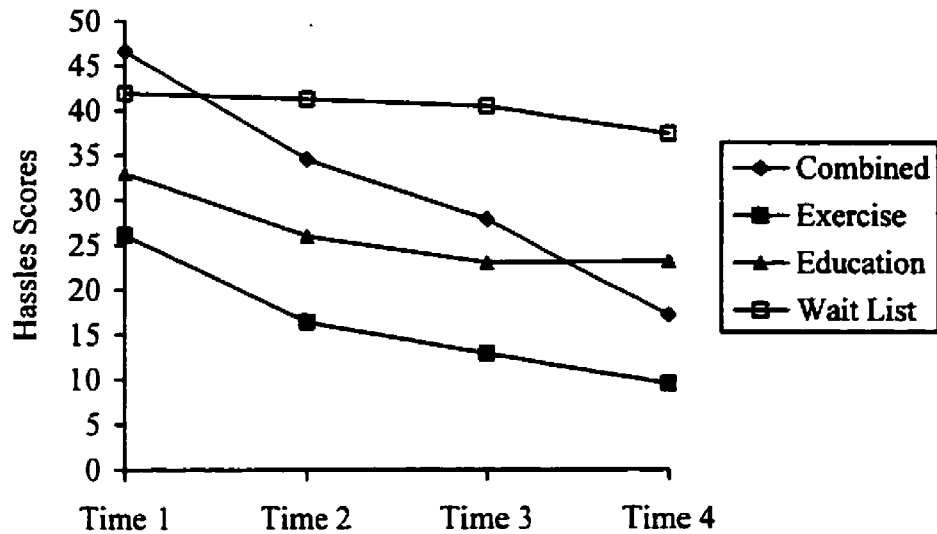


Figure 2. Daily Hassles scores for groups across time.

Simple effects of group. Mean differences on the Symptoms of Stress scores

between groups was significant at times 1, 2, 3, and 4 ($F(3, 57) = 3.27, p < .05$; $F(3, 57) = 2.78, p < .05$; $F(3, 57) = 3.11, p < .05$; and $F(3, 57) = 2.78, p < .05$; respectively). To pinpoint where the differences were, Duncan multiple comparisons procedure was used ($p = .05$). Tests of pairwise comparisons of groups indicated that at time 1, baseline, there were significant differences between the exercise group compared to the combined group, the education group and the wait list group. The exercise group started off with significantly lower scores on the Symptoms of Stress Inventory. At time 2 and at time 3, the exercise group still had significantly lower stress scores than the combined group and the wait list group but not significantly lower than the education group. At time 4, the combined group and the exercise group showed significantly lower stress scores compared to the wait list control. There was also a significant difference between the wait list control and a combination of the 3 treatment groups at time 4 on Symptoms of Stress.

Analysis of the simple effect of group on the Daily Hassles scores showed significance only at time 4 ($F(3, 57) = 2.84, p < .05$). Specific comparisons were examined using the Duncan procedure as above ($p = .05$). Only the combined group and the exercise group were found to be significantly different from the wait list group at time 4. There was no significant difference when the treatment groups were combined and compared to the wait list control.

Simple effects of time. On the Symptoms of Stress Inventory, all 3 treatment groups showed significant changes across time, for the combined education and exercise group $F(3, 171) = 61.03, p < .01$, for the exercise only group $F(3, 171) = 3.32, p < .01$, and for the education only group $F(3, 171) = 6.95, p < .01$. The wait list control group did not show significant changes in the Symptoms of Stress scores across time. Specific comparisons for the combined group found that Symptoms of Stress decreased significantly between times 1 and 2 ($F(1, 35) = 55.12, p < .01$), between times 2 and 3 ($F(1, 35) = 4.48, p < .05$) and between times 3 and 4 ($F(1, 35) = 16.21, p < .01$). For the exercise only group Symptoms of Stress scores showed a significant decrease only between times 1 and 4. The education group showed significant decreases in Symptoms of Stress scores only between times 1 and the other 3 test points ($F(1, 5) = 9.53, p < .05$). The wait list control group did not show a significant time effect for Symptoms of Stress scores so specific comparisons were not examined. Thus, the combined group showed incremental decrease between each test point, the exercise only group did not show significant decrease until time 4, and the education group showed an initial decrease but then no further change.

Analysis of Daily Hassles showed that participants in the combined education and exercise group ($F(3, 171) = 58.35, p < .01$) and the exercise only group ($F(3, 171) = 6.84, p < .01$) had decreases in Daily Hassles scores across time larger than expected by chance. Specific comparison for the combined group indicated significant decreases in Daily Hassles scores between times 1 and 2 ($F(1, 35) = 23.94, p < .01$), between times 2 and 3 ($F(1, 35) = 7.93, p < .01$), and between times 3 and 4 ($F(1, 35) = 37.79, p < .01$). The exercise only group showed significant decreases in Daily Hassles scores between times 1 and 2 ($F(1, 7) = 5.73, p < .05$), but not between times 2 and 3 or times 3 and 4. Thus, as with the Symptoms of Stress scores, the combined group showed incremental decrease between each test point. However, unlike the Symptoms of Stress scores, for the Daily Hassles scores the exercise only group showed an initial decrease but then no further change.

Fitness Differences

Fitness differences were further analyzed in order to determine if fitness per se had an effect on perceived stress and daily hassles. High fitness and low fitness groups were formed on the basis of a median split on meters traveled in 12 minutes at baseline ($Mdn = 1343.75$). There were no significant differences between the high and low fit groups on Symptoms of Stress scores ($F(1, 59) = .11, p > .05$), nor on the Daily Hassles scores ($F(1, 59) = .02, p > .05$).

High and low fitness groups were also formed on the basis of a median split on morning resting heart rate at baseline before treatments began ($Mdn = 64.14$). There was no significant main effect for group on the Symptoms of Stress scores ($F(1, 59) = .29, p > .05$), nor on the Daily Hassles scores ($F(1, 59) = 1.02, p > .05$).

Stress Differences

Finally, high and low stress groups were formed on the basis of a median split on the stress measures to evaluate if high versus low stressed participants showed differences in fitness. When participants were split into high and low Symptoms of Stress ($Mdn = 77$) there was a main effect of group for resting heart rate (see Table 18). Participants with low Symptoms of Stress scores had significantly lower resting heart rates than participants with higher stress scores ($F(1, 59) = 5.08, p < .05$). The high and low stress groups, however, were not significantly different in distance traveled in 12 minutes ($F(1, 59) = 1.90, p > .05$) (see Table 19). When participants were split into groups formed on the basis of high and low Daily Hassles scores ($Mdn = 37$) there were no significant differences in either resting heart rate ($F(1, 59) = .36, p > .05$) (see Table 20) nor on distance traveled in 12 minutes ($F(1, 59) = .13, p > .05$) (see Table 21).

Table 18

Group Means and Standard Deviations of Resting Heart Rate for High and Low Stress

	Time				
Measure/Group	0 weeks	4 weeks	8 weeks	12 weeks	Total
Resting Heart Rate					
Low Stress	62.79 (9.09)	61.55 (8.29)	59.94 (8.49)	59.34 (8.42)	60.90 (8.58)
High Stress	65.97 (6.94)	65.65 (6.96)	65.65 (7.48)	63.95 (7.64)	65.30 (7.21)
Total	64.35 (8.20)	63.57 (7.88)	62.75 (8.45)	61.60 (8.31)	63.07 (8.22)

Table 19

Group Means and Standard Deviations of Distance Traveled for High and Low Stress

Measure/Group	Time				Total
	0 weeks	4 weeks	8 weeks	12 weeks	
Distance Traveled in Meters					
Low Stress	1503.83 (348.51)	1536.49 (402.51)	1620.77 (441.49)	1677.22 (416.47)	1584.58 (404.60)
High Stress	1392.92 (320.79)	1442.50 (373.04)	1476.88 (369.13)	1508.75 (370.18)	1455.26 (357.00)
Total	1449.28 (337.03)	1490.27 (387.96)	1550.00 (410.57)	1594.36 (400.21)	1521.00 (386.60)

Table 20

Group Means and Standard Deviations of Resting Heart Rate for High and Low Hassles

Measure/Group	Time				Total
	0 weeks	4 weeks	8 weeks	12 weeks	
Resting Heart Rate					
Low Stress	64.35 (8.66)	62.77 (8.61)	61.52 (8.60)	61.24 (8.81)	62.47 (8.65)
High Stress	64.35 (7.84)	64.39 (7.10)	64.02 (8.23)	61.98 (7.89)	63.69 (7.74)
Total	64.35 (8.20)	63.57 (7.88)	62.75 (8.45)	61.60 (8.31)	63.07 (8.22)

Table 21

Group Means and Standard Deviations of Distance Traveled for High and Low Hassles

Measure/Group	Time				Total
	0 weeks	4 weeks	8 weeks	12 weeks	
Distance Traveled in Meters					
Low Stress	1464.92 (329.51)	1512.70 (404.59)	1564.11 (440.80)	1609.88 (418.59)	1537.90 (399.39)
High Stress	1433.13 (349.52)	1467.08 (375.46)	1535.42 (383.83)	1578.33 (386.78)	1503.49 (373.82)
Total	1449.28 (337.03)	1490.27 (387.96)	1550.00 (410.57)	1594.36 (400.21)	1521.00 (386.60)

Summary of the Results

The results indicate that all 3 treatment programs had a positive effect on perceived stress but the combined exercise and education program had a positive affect on stress above and beyond the affect of either treatment in isolation. Only for the participants in the combined program were there significant decreases in perceived stress between every 4 week test point of the 12 week program. For participants in the education program, there was a significant decrease in symptoms of stress, that occurred during the first 4 weeks of the program, but further change was not significant. People in the exercise only program also showed a decrease in symptoms of stress, but the decrease was more gradual with the significant difference showing only between baseline and 12 weeks later. Participants on the wait list showed no significant changes in symptoms of stress.

The combined program also had a more positive effect than the individual treatments on participants' reports of perceived daily hassles. Again, only for the participants in the combined program were there significant decreases in daily hassles between every 4 week test point of the 12 week program. The exercise program had a positive effect on daily hassles, with most of the change occurring between baseline and 4 weeks later. Neither the education group nor the wait list group reported significant changes in daily hassles over the 12 weeks.

There was no evidence from the results that the programs had a statistically significant effect on fitness. The combined lifestyle education and exercise program improved self-reported stress and daily hassles but had no statistically significant effect on fitness. Although all 3 treatment programs lowered stress, none of the programs had significant effects on fitness. Furthermore, when the sample was divided into high and low fitness, there were no significant differences between high and low fit groups on indices of stress or daily hassles. However, participants with low Symptoms of Stress scores at the beginning of the study had significantly lower resting heart rates than participants with high stress scores.

Chapter 5: Discussion

The results of the study indicate that in a mixed population of adults, all 3 treatment programs significantly reduced reported symptoms of stress; whereas, the no contact wait list group showed no significant changes. Taken in combination, the programs were significantly different from the no contact wait list control group. Furthermore, unlike the single modality treatments, the combined lifestyle and fitness training reduced perceived stress as well as daily hassles at each test point.

The results also indicate that changes in stress occurred without concomitant changes in fitness. Changes in stress were found for the combined, exercise, and education groups even though significant changes in fitness were not detected in any of the groups. Furthermore, high fit participants did not differ significantly from low fit participants in terms of self-reported stress and daily hassles. The results suggest that participation and not fitness per se reduces stress and daily hassles. Perhaps the most important active ingredients needed for an effective lifestyle change program include psychosocial factors; such as, social contact, community support, social learning, self-efficacy, and shared meaning along with regular exercise.

Understanding the Results in the Context of Self-Efficacy Theory

The results of the study can be understood within the context of social learning and self-efficacy theory. According to self-efficacy theory (Bandura, 1977; 1982; 1984; 1989; 1991), a highly influential determinant of human agency is perceived self-efficacy. Self-efficacy is defined as a belief in one's ability to mobilize motivation, cognitive resources, and necessary action to meet situational demands (Bandura, 1991; Bandura, Cioffo, Barr Taylor, & Brouillard, 1988). Self-efficacy is not a discrete act, rather a

general attitude. Expectations of personal ability influence whether coping will be initiated as well as whether there will be persistence of coping behavior. The stronger a person's sense of self-efficacy the more vigorous and persistent will be their efforts in demanding situations. Therefore, self-efficacy is theoretically and empirically linked to sustained effort, strong goal commitment, and superior performance.

The social learning component of self-efficacy theory involves vicarious experience. When people of varying characteristics are witnessed succeeding at various activities, there is an increase in the observer's belief in being able to perform a similar task and attain similar goals. Witnessing people similar to oneself achieve through effort and perseverance increases beliefs about one's own capabilities. Furthermore, people learn from each other through comparison and can thereby pick up effective coping strategies.

Self-efficacy can also be instilled through mastery experiences, social persuasion and physiological feedback. Mastery experiences are experiences of success through achievement of goals. The goals need not be monumental, but more modest sub-goal achievements along the way are sufficient to instill a sense of self-efficacy. Social persuasion is also an effective way of instilling a sense of self-efficacy. Convincing people they possess the capabilities needed to cope and succeed in demanding situations, if not unrealistic, will lead people to exert greater effort and thereby meet the demands of the situation. Finally, self-efficacy can be modified by altering autonomic arousal or at least the interpretation of autonomic arousal. When judging capabilities, people interpret their physiological reactions to situations. Racing heart, rapid breathing, and adrenaline

rushes can be reduced or be given more positive interpretation so as to enhance one's sense of self-efficacy.

All 3 treatment programs in the present study gave participants opportunities to alter their perceived self-efficacy in several ways. There were opportunities for mastery experiences, vicarious experiences, social comparison, social persuasion, altering the interpretation of physiological arousal, and even directly altering physiological reactivity to demanding situations. Such experiences could presumably alter beliefs that one can overcome obstacles and achieve goals in daily living. As such, one would expect a decrease in self-reported stress and daily hassles.

When people believe and have evidence that they can regulate their behavior in the face of demanding situations, they develop a sense of personal control. Exercising control over potential threats has been found to diminish stress (Averill, 1973; Geer, Davison, & Gatchell, 1970; Glass et al., 1972; Gunnar-Vongnechten, 1978; Miller, 1980). Furthermore, the effect seems to generalize across domains. For example, Mineka, Gunnar, and Champoux (1986) found that monkeys raised under conditions where they could exercise control over their environment were less fearful of novel threats than monkeys raised in environments where they had little personal control. Similarly, social learning theory proposes that when people believe they cannot control threatening situations they dwell on personal deficiencies, and thereby constrain and impair their level of functioning.

The positive psychological effects of healthy lifestyle programs may be attributed to the positive psychosocial influence involved when one joins a program with other individuals with shared values. The psychosocial effects of lifestyle and exercise

programs include those secondary effects such as respite from daily routine, social reinforcement, feelings of mastery and competence, and increased self-esteem. However, it has also been found that when psychosocial factors are held constant across group conditions, there is a significant effect of physical activity over and above the psychosocial effects (Desharnais et al., 1993). The added effect of fitness conditioning may explain the findings in the present study that the combined lifestyle and education program was more effective in reducing stress than the education only condition. Although there was not a significant change in the fitness variables over time, anecdotal reports indicated that participants who had an exercise component to their program were noticing decreases in waist size, lack of breathlessness in daily activities, and improved energy. These environmental changes could provide evidence of effectiveness and act to reinforcement people's sense of self-efficacy.

Speculation that change of self-efficacy is the operative mechanism responsible for changes in perceived stress and daily hassles is not contradicted by the results of the present study nor do the results provide explicit evidence to support the speculation. It would be interesting to investigate the theory by using qualitative research to empirically evaluate people's sense of self-efficacy throughout the course of a lifestyle change program.

Strengths and Limitations of the Study

Strengths

There are several strengths inherent in the present study. The programs evaluated in this study used interventions designed to promote generalization and long-term maintenance of change. The program interventions focused on present, well-defined

problems and were oriented toward action and not simply contemplation. Participant contact with instructors emphasized positives rather than focusing on pathology. A mixed population of sedentary adults was investigated instead of examining effects on a narrowly defined population. Stress and fitness variables were examined conjointly as people progressed through the treatments, instead of examining only one type of outcome. Intervention effectiveness was evaluated at 4 time points instead of simply pre and post treatment. And perhaps most importantly, the study collected information regarding stress and fitness variables using field research instead of laboratory research.

Differences between laboratory and field research affect the generalizability of the results. Outcomes based on laboratory research done in tightly controlled laboratory conditions are difficult to generalize to normal real-world conditions. Applicability of the findings is limited to those conditions under which the results were obtained. In the present study, the sample was drawn from a population of people who would, under normal real world conditions, sign up for a lifestyle change program and the programs were delivered in a manner typical for healthy active lifestyle programs. Therefore, the results are applicable to those people who would normally engage in health and wellness training and not to a hypothetical population of people.

Information collected in the present research may aid in the development of lifestyle change programs. Decisions about which components to include in health and wellness programs should be data based. In the current study because the treatment groups varied in the components of treatment that were provided, the research provided a preliminary account of those components necessary to facilitate change.

Limitations

In general, significant differences between active treatment conditions is more difficult to demonstrate than significant differences between treatment and a no treatment conditions because of the subtlety of the discernment. Comparing treatment verses non-treatment groups usually produces relatively large effect sizes but comparisons between treatment groups generally yields more subtle differences. A much larger sample is normally required to detect differences between treatments than differences between treatment and no treatment conditions.

To generate sufficient statistical power a minimum cell size of between 16-20 subjects was targeted. In actual fact, the cell size was considerably lower than this target in all but the combined group. The unequal cell size highlights a recurrent difficulty in conducting research in naturalistic settings; that is, subjects do not sign up for the treatment conditions that the researcher would prefer. Inability to achieve targeted numbers, due to the exegeses of real world research, resulted in low power. Power is the likelihood of rejecting the null hypothesis when it is false. In the present study, power is the probability of finding significant differences between treatments or significant differences over time when in fact there are significant differences that exist. Power is a function of the criterion for statistical significance (α), the size of the sample (N), and the effect size, or actual difference that exists between groups (η). With only 8 participants in the exercise only group and 6 in the education only group appropriate for analysis in the study, some of the cell sizes were very small. As such, the amount of variability in the dependent variables associated with the variation in the different group programs was low, and the power to detect significant differences was compromised.

Given the low power of the study, it is quite remarkable that significant differences were found at all. For example, the significant difference between the combined active treatment groups and the wait list group on symptoms of stress could be detected at the end of the study. However, implications and conclusions of the findings are limited. Other between group differences may very well exist but went undetected in the present study because of the very small number of subjects in the education only and exercise only groups. On the other hand, with very large samples, rejection of the alternative hypothesis would be more probable and, in this sense, the findings of the present study may represent very robust effects that can be detected with very little power. In conclusion, the results of the present study are to be considered preliminary findings indicating tendencies requiring further investigation.

Directions for Future Research

There are several directions that research into health and wellness programs needs to take. Future research could evaluate the proposal that self-efficacy is a central mechanism of healthy lifestyle behavior change. Self-judged efficacy could be measured and correlated with self-reported stress and daily hassles. If data from large samples was available, participant profile information could be used to identify gradated self-efficacy by treatment interactions.

Profile information could also be used to identify participant characteristics which correspond with the successful use of particular treatment components. Combined treatment, fitness training alone or healthy lifestyle education alone may be differentially needed or beneficial for some individuals more than others. There are most likely many for whom combined treatments are essential, and others for whom they are completely

unnecessary. For example, people who are already active and who have regularly scheduled physical exercise, or those people who have physically challenging jobs, may benefit from lifestyle education but find no further benefit or sense of mastery from an additional group exercise component. Alternatively, someone who is well versed in healthy lifestyle practices but has difficulty applying the knowledge in everyday life, may benefit from the group exercise program but gain little from the additional education component.

Treatment is not likely to be effective for everyone in a study. Identifying the sources of variance to which individual differences can be attributed would help in understanding the treatments and their effect. Systematic assessment and tests of case characteristic by treatment component interactions would help to inform judgments about which kinds of people would benefit from which kinds of treatment. Identification of those types of people who would profit from single modality treatment and those who would profit from a combined treatment would advance the understanding of lifestyle education further than mean comparisons between treatment conditions and aid in the effective prescription of primary prevention.

Demographic profile information could be used to identify case characteristic by treatment interactions. Age, gender, education level, and ethnicity could be examined in conjunction with treatment effect to determine if certain types of individuals benefit more from particular types of treatment. Such analyses would help in making future decisions about when combined treatments are needed and beneficial and permit individually tailoring future treatment packages to maximize effectiveness as well as targeting particular population for future treatment administration. Evaluation of interactions of

participant characteristics with treatment condition would provide a more comprehensive analysis than the simple mean comparisons between treatment conditions.

Future analysis of participants' readiness to change before the beginning of a lifestyle change program could aid in the prescription of primary prevention by determining those individuals who would most benefit from taking particular instruction at particular stages of change. Prochaska, DiClemente, and Norcross (1992) characterize the behavior change process in terms of the following stages: pre-contemplation, contemplation, preparation, action, and maintenance. The amount of progress participants make in a lifestyle and or fitness program may depend on where they are in their process of change. Pre-contemplators have no conscious intention to change, contemplators are aware of a problem but not quite committed to take action, people in the preparation stage are committed to take action and have made some initial attempts, in the action stage people are actively attempting to modify their behavior and change their environment, and the maintenance stage is characterized by people who are at the point of consolidating gains. Future research could evaluate readiness for change and determine the optimum points of particular treatment entry. Programs could be tailored to include components effective for people at different stages of change; thereby, maximizing efficiency of resources.

Conclusions

Forming an active healthy lifestyle is not a particular treatment that one applies to a particular disorder in order to attain a narrowly defined effect. Lifestyle education and exercise are general treatment approaches which have application in a broad category of adjustment difficulties and health problems

affecting many domains of functioning. Lifestyle change programs teach people to monitor behavior they wish to change, help people set short-range attainable goals, help motivate people to direct their efforts, and provide social support to help sustain behavior. Participation in such programs and forming a sense of community with people pursuing active healthy lifestyles may be one of the essential active ingredients needed to reduce stress and increase a sense of health and well-being.

The use of exercise and lifestyle education is an empirically supported multi-modal approach to promoting psychological well-being. Physical exercise and healthy lifestyle education may be an excellent point of entry for the treatment and prevention of a range of psychopathology because such methods are socially acceptable and do not imply the existence of a problem. Lifestyle education and exercise may improve confidence in people's ability to cope and thereby maintain stress at healthy levels preventing psychological or physiological harm. Preventative psychotherapy in the form of healthy active lifestyle education is a forward looking approach in clinical medicine to promote health and well-being. Given the substantive savings inherent in preventative medicine, it warrants further investigation and refinement.

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Appendix A

Consent for Participation in Research

Research Project: Lifestyle Interventions, Stress and Fitness

Investigators: Carol A Malec M.Sc. Candidate
 Angelina Baydala M.Sc. Candidate
 Dr. Bryan Hiebert Ph.D.

I agree to participate in the research project entitled: Lifestyle Interventions, Stress, and Fitness. After reading the enclosed information about the study, I understand that consent means that I will take part in answering questionnaires, completing fitness tests and measuring resting heart rates at home. This will involve a 12 week period of participation.

The 12 minute exercise test will be administered by licensed fitness instructors. The exercise testing will be supervised by both a certified fitness instructor and a registered nurse. Licensing for both health professionals include current CPR certification.

I understand that participation in this study may be terminated at any time by my request or at the request of the investigator. Participation in the testing sessions and/or withdrawal from the testing sessions will not adversely affect me in any way, nor affect the instruction or delivery of the program that I have enrolled in except that the rebate will not be in effect unless I complete the entire 12-week program and complete all of the required testing.

I understand that the information from this study will remain confidential and will not be associated with my identity in any way. My identity will not be revealed to anyone other than the primary investigators, Carol Malec and Angelina Baydala. I understand that only group data will be reported in any published reports. I understand that confidentially I may have access to my own results and measurements that are recorded as part of the study.

I understand that if I have any questions I can contact the researcher at: Carol Malec 289-8422/ 220-3675, Angelina Baydala 283-9417, Dr. Bryan Hiebert at 220-7770, Faculty of Education Joint Research Ethics Committee at 220-5626, or the Office of the Vice-President of Research at 220-3381.

 Date

 Signature of Participant

 Investigator's Signature

 Participant's Printed Name

Appendix B

The Daily Hassles Scale

Published by MIND GARDEN

P.O. Box 60669 Palo Alto CA 94306

Directions:

Hassles are irritants that can range from minor annoyances to fairly major pressures, problems, or difficulties. They can occur few or many times in any given time period. Listed below are a number of ways in which a person can feel hassled.

When you respond to the questions on the inside of this questionnaire, please use the time period of the last 2 weeks including today. How much was the item in the questionnaire a hassle for you in the last 2 weeks ?

Read each item and circle 0 if the item was no hassle for you in the time period. If it was a hassle, indicate how severe the hassle was by circling 1, 2, or 3.

NAME: _____

GROUP: _____ (combined, exercise, education, wait list)

SESSION: _____ (measurement time 1, 2, 3, or 4)

DATE: _____

How much of a hassle was this for you?(In the last 2 weeks)

0 = None or did not occur

1 = Somewhat severe

2 = Moderately severe

3 = Extremely severe

1.	Misplacing or losing things	0	1	2	3
2.	Troublesome neighbors	0	1	2	3
3.	Social obligations	0	1	2	3
4.	Inconsiderate smokers	0	1	2	3
5.	Troubling thoughts about your future	0	1	2	3
6.	Thoughts about death	0	1	2	3
7.	Health of a family member	0	1	2	3
8.	Not enough money for clothing	0	1	2	3
9.	Not enough money for housing	0	1	2	3
10.	Concerns about owing money	0	1	2	3
11.	Concerns about getting credit	0	1	2	3
12.	Concerns about money for emergencies	0	1	2	3
13.	Someone owes you money	0	1	2	3
14.	Financial responsibility for someone who doesn't live with you	0	1	2	3
15.	Cutting down on electricity, water, etc.	0	1	2	3

16.	Smoking too much	0	1	2	3
17.	Use of alcohol	0	1	2	3
18.	Personal use of drugs	0	1	2	3
19.	Too many responsibilities	0	1	2	3
20.	Decisions about having children	0	1	2	3
21.	Non-family members living in your house	0	1	2	3
22.	Care for pet	0	1	2	3
23.	Planning meals	0	1	2	3
24.	Concerned about the meaning of life	0	1	2	3
25.	Trouble relaxing	0	1	2	3
26.	Trouble making decisions	0	1	2	3
27.	Problems getting along with fellow workers	0	1	2	3
28.	Customers or clients give you a hard time	0	1	2	3
29.	Home maintenance (inside)	0	1	2	3
30.	Concerns about job security	0	1	2	3
31.	Concerns about retirement	0	1	2	3
32.	Laid off or out of work	0	1	2	3
33.	Don't like current work duties	0	1	2	3
34.	Don't like fellow workers	0	1	2	3
35.	Not enough money for basic necessities	0	1	2	3
36.	Not enough money for food	0	1	2	3
37.	Too many interruptions	0	1	2	3

38.	Unexpected company	0	1	2	3
39.	Too much time on hands	0	1	2	3
40.	Having to wait	0	1	2	3
41.	Concerns about accidents	0	1	2	3
42.	Being lonely	0	1	2	3
43.	Not enough money for health care	0	1	2	3
44.	Fear of confrontation	0	1	2	3
45.	Financial security	0	1	2	3
46.	Silly practical mistakes	0	1	2	3
47.	Inability to express yourself	0	1	2	3
48.	Physical illness	0	1	2	3
49.	Side effects of medication	0	1	2	3
50.	Concerns about medical treatment	0	1	2	3
51.	Physical appearance	0	1	2	3
52.	Fear of rejection	0	1	2	3
53.	Difficulties with getting pregnant	0	1	2	3
54.	Sexual problems that result from physical problems	0	1	2	3
55.	Sexual problems other than those resulting from physical problems	0	1	2	3
56.	Concerns about health in general	0	1	2	3
57.	Not seeing enough people	0	1	2	3

58.	Friends or relatives too far away	0	1	2	3
59.	Preparing meals	0	1	2	3
60.	Wasting time	0	1	2	3
61.	Auto maintenance	0	1	2	3
62.	Filling out forms	0	1	2	3
63.	Neighborhood deterioration	0	1	2	3
64.	Financing children's education	0	1	2	3
65.	Problems with employees	0	1	2	3
66.	Problems on job due to being a woman or man	0	1	2	3
67.	Declining physical abilities	0	1	2	3
68.	Being exploited	0	1	2	3
69.	Concerns about bodily functions	0	1	2	3
70.	Rising prices of common goods	0	1	2	3
71.	Not getting enough rest	0	1	2	3
72.	Not getting enough sleep	0	1	2	3
73.	Problems with aging parents	0	1	2	3
74.	Problems with your children	0	1	2	3
75.	Problems with persons younger than yourself	0	1	2	3
76.	Problems with your lover	0	1	2	3
77.	Difficulties seeing or hearing	0	1	2	3
78.	Overloaded with family responsibilities	0	1	2	3
79.	Too many things to do	0	1	2	3

80.	Unchallenging work	0	1	2	3
81.	Concerns about meeting high standards	0	1	2	3
82.	Financial dealings with friends or acquaintances	0	1	2	3
83.	Job dissatisfactions	0	1	2	3
84.	Worries about decisions to change jobs	0	1	2	3
85.	Trouble with reading, writing, or spelling abilities	0	1	2	3
86.	Too many meetings	0	1	2	3
87.	Problems with divorce or separation	0	1	2	3
88.	Trouble with arithmetic skills	0	1	2	3
89.	Gossip	0	1	2	3
90.	Legal problems	0	1	2	3
91.	Concerns about weight	0	1	2	3
92.	Not enough time to do the things you need to do	0	1	2	3
93.	Television	0	1	2	3
94.	Not enough personal energy	0	1	2	3
95.	Concerns about inner conflicts	0	1	2	3
96.	Feel conflicted over what to do	0	1	2	3
97.	Regrets over past decisions	0	1	2	3
98.	Menstrual (period) problems	0	1	2	3
99.	The weather	0	1	2	3
100.	Nightmares	0	1	2	3
101.	Concerns about getting ahead	0	1	2	3

101.	Hassles from boss or supervisor	0	1	2	3
103.	Difficulties with friends	0	1	2	3
104.	Not enough time for family	0	1	2	3
105.	Transportation problems	0	1	2	3
106.	Not enough money for transportation	0	1	2	3
107.	Not enough money for entertainment	0	1	2	3
	and recreation	0	1	2	3
108.	Shopping	0	1	2	3
109.	Prejudice and discrimination from others	0	1	2	3
110.	Property, investments, or taxes	0	1	2	3
111.	Not enough time for entertainment and recreation	0	1	2	3
112.	Yard work or outside home maintenance	0	1	2	3
113.	Concerns about news events	0	1	2	3
114.	Noise	0	1	2	3
115.	Crime	0	1	2	3
116.	Traffic	0	1	2	3
117.	Pollution	0	1	2	3

Appendix C

DEPARTMENT OF PSYCHOSOCIAL NURSING
UNIVERSITY OF WASHINGTON

SYMPTOMS OF STRESS INVENTORY

A Self Assessment

This questionnaire is designed to measure the different ways people respond to stressful situations. In the booklet are sets of questions dealing with various physical, psychological, and behavioral responses. We are particularly interested in the frequency with which you may have experienced these stress related symptoms during the past 2 weeks.

Name: _____

Group: _____ (Combined, Exercise, Education, Wait List)

Session: _____ (Measurement time 1, 2 3, or 4)

Date: _____

Please circle the most appropriate response to each question.

0 = never

1 = infrequently

2 = sometimes

3 = often

4 = very frequently

Sometimes people under stress experience a variety of physical responses. During the designated period have you been bothered by:

1. Flushing of your face
2. Sweating excessively even in cold weather
3. Severe itching
4. Skin rashes
5. Breaking out in cold sweats
6. Cold hands or feet
7. Hot or cold spells

Have you noticed any of the following symptoms when not exercising:

8. Pain in your heart or chest
9. Thumping of your heart
10. Rapid or racing heartbeats
11. Irregular heart beats
12. Rapid breathing
13. Difficult breathing

Have you experienced:

- 14. A dry mouth
- 15. having to clear your throat often
- 16. A choking lump in your throat
- 17. Hoarseness
- 18. Nasal stuffiness
- 19. Colds
- 20. Colds with complications (e.g. bronchitis)
- 21. Increased asthma attacks

Have you experienced:

- 22. Spells of severe dizziness
- 23. Feeling faint
- 24. Blurring of your vision
- 25. Migraine headaches
- 26. Tension headaches
- 27. sinus headaches
- 28. Increased seizures (convulsions)

Have you been bothered by:

- 29. Indigestion
- 30. Nausea
- 31. Severe pains in your stomach
- 32. Increased appetite

- 33. Poor appetite
- 34. loose bowel movements or diarrhea
- 35. Heartburn
- 36. Constipation

Muscle tension is a common way of experiencing stress. Have you noticed excessive tension , stiffness, soreness or cramping in the muscles in your:

- 37. Neck
- 38. Jaw
- 39. Forehead
- 40. Eyes
- 41. Back
- 42. Shoulders
- 43. Hands or arms
- 44. Legs
- 45. Abdomen or stomach

In your day-to-day activities, have you noticed symptoms of anxiety or restlessness, such as:

- 46. Fidgeting with your hands
- 47. pacing
- 48. Chewing your lips
- 49. Difficulty sitting still
- 50. Increased eating

- 51. Increased smoking
- 52. Biting your nails
- 53. Having to urinate frequently
- 54. Having to get up in the night to urinate
- 55. Difficulty in falling asleep
- 56. Difficulty in staying asleep
- 57. Early morning awakening
- 58. Changes in your sexual relationship

Have you noticed:

- 59. Worrying about your health
- 60. Stuttering or stammering
- 61. Shaking or trembling
- 62. Being keyed up and jittery
- 63. Feeling weak and faint
- 64. Frightening dreams
- 65. Being uneasy and apprehensive

Stress is often accompanied by a variety of emotions during the designated period have you felt:

- 66. Alone and sad
- 67. Unhappy and depressed
- 68. Like crying easily
- 69. Like life is entirely hopeless

70. That you wished you were dead

71. That worrying gets you down

Does it seem:

72. That little things get on your nerves

73. You are easily annoyed and irritated

74. When you feel angry, you act angrily toward most everything

75. Angry thoughts about an irritating event keep bothering you

76. You become mad or angry easily

77. Your anger is so great that you want to strike something

78. You let little annoyances build up until you just explode

79. You become so upset that you hit something

In your day-to-day living do you find:

80. Working tires you out completely

81. Severe aches and pains make it difficult for you to do your work

82. You get up tired and exhausted in the morning even when you sleep with your usual amount of sleep

83. You suffer from severe nervous exhaustion

84. You get nervous and shaky when approached by a superior

85. your thinking gets completely mixed-up when you have to do things quickly

86. You become so afraid you can't move

87. You must do things very slowly to do them without mistakes

88. You get directions and order wrong

- 89. You are unable to keep thoughts from running through your mind
- 90. You are fearful of strangers and/or strange places make you afraid
- 91. Sudden noises make you jump or shake
- 92. Frightening thoughts keep coming back
- 93. You become suddenly frightened for no good reason
- 94. You have difficulty in concentrating
- 95. What other ways do you experience stress, tension or anxiety?

For the remaining questions, please circle the appropriate numbers in question.

- 96. Looking back over the last 12 weeks and comparing how you feel now with how you felt at the start, generally speaking, do you?
 - 0. Feel worse than at the beginning of the study
 - 1. Feel unchanged from the beginning of the study
 - 2. Feel somewhat better than at the beginning of the study
 - 3. Feel a lot better than at the beginning of the study
 - 4. Feel exceptionally better than at the beginning of the study

- 97. If you do feel changed how much of that change do you attribute to your participation in this research study?
 - 0. No relation to the research study
 - 1. Somewhat due to participating in the research study
 - 2. Largely due to participating in the research study

3. Totally due to participating in the research study

98. If you do feel changed how much of that change do you attribute to your participation in lifestyle education program or the exercise program ?

0. No relation to the program

1. Somewhat due to participating in the program

2. Largely due to participating in the program

3. Totally due to participating in the program

99. How many cigarettes per day do you smoke?

0. none

1. less than 6

2. between 7 and 19

3. 20 (one pack) or more

100. How much coffee or tea do you drink each day?

0. none

1. 3 cups or less

2. 4-7 cups

3. 8 or more cups

101. How often do you drink alcoholic beverages?

- 0. never
- 1. less than once per month
- 2. once or twice per week
- 3. weekends only
- 4. daily or four or more days per week

102. When you drink, how much do you usually drink?

- 0. none
- 1. 1 or 2 drinks per Occasion
- 2. 3 to four drinks per occasion
- 3. 5 or more drinks

103. What type of alcoholic beverage do you usually drink? (circle all appropriate answers)

- 0. none
- 1. beer and Wine and Liquor, all three
- 2. Beer and Wine only
- 3. Beer and Liquor only
- 4. Wine and Liquor only
- 5. Beer only
- 6. Wine only
- 7. Liquor only

Personal Information

104. age: _____

105. sex: female _____ male _____

106. Occupation: _____

107. Ethnic background:

1 Afro-American

2. Asian American

3. Caucasian

4. Chicano or Spanish surnamed

5. Native American

6. Other

108. Circle the number of years of education you have completed:

8 9 10 11 12 13 14 15 16 17 18 19

high school

college/university

graduate education

109. circle the highest educational degree that you have completed:

a. grade school

b. high school

c. Community College (Associate degree)

- d. University (Bachelor's degree)
- e. Master's degree
- f. Doctoral degree

110. Are you employed?

- 0. No and not currently looking for employment
- 1. No but currently looking for employment
- 2. Currently working (indicate approximately, the # of hours per week)_____
- 3. Other (maternity leave, compensation, disability)

111. Do you work shift work?

- 0. No
- 1. Yes

112. Please indicate your marital status:

- 0. Single
- 1. Co-habiting
- 2. Married
- 3. Separated
- 4. Divorced
- 5. Widowed

113. Please indicate your living arrangements?

- 0. Live on your own
- 1. Live with a spouse or significant other
- 2. Live with a roommate or roommates
- 3. Live with a parent or parents

114. How many children do you have?

- 0. Have no children
- 1. Expecting a child
- 2. Have 2 children or less
- 3. Have more than 2 children

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Appendix D

Stress Medicine: You Matter Too

An Intervention Guide For Building A Healthy Lifestyle

Ch. 1: Ready for Change

Topics

- stages of change
- readiness for change
- lifestyle planning
- healthy lifestyle
- action planning

Learning Outcomes

- acknowledgment of people's roles in managing change in their lives
- analysis of the factors influencing lifestyle & their importance

Home Practice

- rate & pie lifestyle planning

Ch. 2: Maintaining Balance and Understanding Stress

Topics

- stress model
- model for stress control
- stress framework
- coping framework
- personal management skills
- goal setting/self-management
- action planning

Learning Outcomes

- understand stress
- understand coping

Home Practice

- goal sheet - set 3 goals
- set exercise goal

Ch. 3: Taking Charge of Nutrition

Topics

- nutrition and stress
- nutrition planning
- Canada food guide to healthy eating

Learning Outcomes

- understand what healthy eating is and why it is important
- understand the value of Canada's food guide to healthy eating
- understand the contribution of certain nutrients to health and stress
- understand nutrition tips to manage stress

Home Practice

- follow Canada's food guide to healthy eating
- self-monitor food intake
- lifestyle planner

Ch. 4: Habit Management and Behavior Change

Topics

- Steps for habit management
- Awareness worksheet (triggers, self-talk, etc.)
- Reinforcement and maintenance
- awareness - trigger - behavior - support model

Learning Outcomes

- understand the context for habit change
- identify triggers and supports

Home Practice

- trigger - behavior - support grid

Ch. 5: Eating on the Run: Strategies for Choosing Healthy Fare

Topics

- healthy restaurant eating
- menu planning
- shopping tips

Learning Outcomes

- understand how to make healthy choices in restaurants
- tips for menu planning and grocery shopping
- tips for healthy eating in a hurry

Home Practice

- log eating out choices
- complete a menu plan for a day or week

Ch. 6: Pulling It All Together

Topics

- review and reflection
- values and priorities
- changes and strategies
- healthy weight

Learning Outcomes

- identify small changes and strategies for achieving them
- make links between personal values, beliefs, and behavior
- awareness of lifestyle changes
- understand healthy weight

Home Practice

- identify and log small changes
- identify strategies for change

Ch. 7: The Self-Talk/Emotion Connection: Becoming Your Own Best Friend

Topics

- being aware of self-talk
- changing self-talk for stress control
- self-coaching
- building self-esteem

Learning Outcomes

- identify links between self-talk and emotion
- identify links between self-talk and behavior

Home Practice

- +/- monitoring sheet
- integrate self-talk monitoring with action planner

Ch. 8: Food Labels: What They Really Mean

Topics

- ingredients lists
- label reading
- nutritional claims

- facts on fat and fiber

Learning Outcomes

- able to read and understand food labels
- identify high fiber food sources
- identify where fat is in ones diet

Home Practice

- read and analyze the food labels of your favorite foods

Ch. 9: Relaxation: Skill for the Future

Topics

- background information
- stress response and relaxation response
- relaxation practice exercise

Learning Outcomes

- understand that stress and relaxation are physiological opposites
- practice a relaxation exercise

Home Practice

- home practice relaxation
- log hr, rr, ft pre/post practice

Ch. 10: Healthy Living and Wellness

Topics

- healthy living: wellness vs. illness
- general information: self-talk, water, sleep
- specific information: health risks, alcohol, smoking, drugs
- specific information: stress & illness
- circle diagram depicting symptoms & disease
- stress symptom check list

Learning Outcomes

- understand health and health risks
- identify lifestyle factors affecting long term health and wellness

Home Practice

- personal research to personalize the information

Ch. 11: Active Living

Topics

- healthy living: programs
- healthy weight: programs
- fit for anything: programs
- review of principles
- aging and activity

Learning Outcomes

- understand components of a healthy exercise program
- identify how exercise is an investment in future health and wellness

Home Practice

- assessment of present program
- consolidate data from present program

Ch. 12: Next Steps

Topics

- reward and maintenance
- guidelines for maintenance
- review to consolidate previous learning
- share success stories
- set future goals

Learning Outcomes

- gain insight into ways to improve programs
- lifestyle jeopardy
- feel encouraged by success
- develop personal maintenance plan

Home Practice

- implement personal maintenance plan

Additional Resources

Reading list

Internet sites

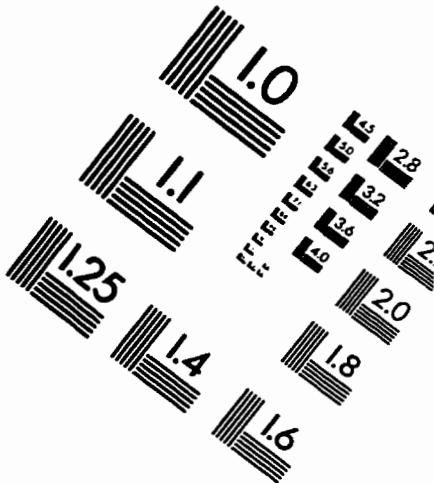
Self-monitoring stress

General Program Components

Log Book

Weekly exercise tips

Weekly home practice activities



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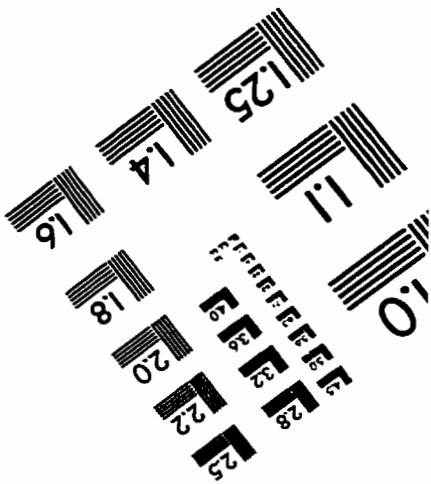
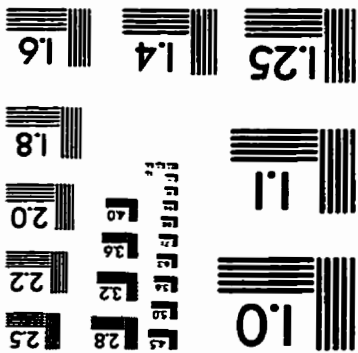
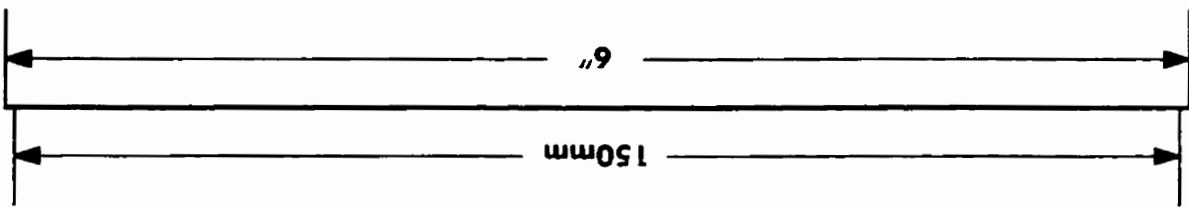
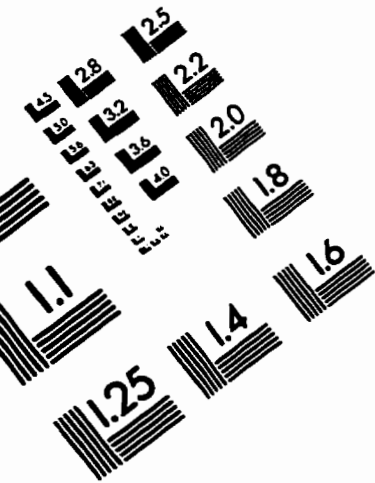


IMAGE EVALUATION
TEST TARGET (QA-3)

