THE EFFECTIVENESS OF AN EXERCISE INTERVENTION PROGRAM IN REDUCING CARDIOVASCULAR RISK AMONG EMPLOYEES IN A UNIVERSITY SETTING

THESIS

Presented to the Graduate Council of the University of North Texas in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Susan J. Ball, B.A.
Denton, Texas
May, 1992
Ball, Susan J., *The Effectiveness of an Exercise Intervention Program in Reducing Cardiovascular Risk Among Employees in a University Setting*. Master of Science (Health Promotion), May, 1992, 80 pp., 8 tables, 1 diagram, 1 illustration, bibliography, 60 titles.

Nine physiological measures were evaluated pre- to post-intervention on subjects participating in a university health promotion program over a seven-month period. Frequency of program attendance and choice of activity were also assessed. Of the 88 employees initially screened, most of the subjects were staff members (n=82, 93%), with a majority being female (n=68, 77%).

Significant differences in physiological measures were found pre- to post-intervention between "higher" and "lower" cardiovascular risk participants, primarily due to the type of activity chosen. The results indicate that health promotion programs at a university are an effective way to have an impact on employees in reducing their cardiovascular risk factors.
# TABLE OF CONTENTS

| LIST OF TABLES | ..................v |
| Chapter | |
| I. INTRODUCTION | 1 |
| Statement of the Problem | |
| Purpose of the Study | |
| Hypotheses of the Study | |
| Significance of the Study | |
| Limitations | |
| Assumptions | |
| Definition of Terms | |
| II. REVIEW OF LITERATURE | 12 |
| Worksite Health Promotion Programs | |
| High Risk Populations at Worksite Wellness Programs | |
| Effectiveness of Work Site Health Promotion | |
| Criteria for Determining High-Risk Employees | |
| University/College Health Promotion Programs | |
| Summary | |
| III. METHODOLOGY | 41 |
| Selection of Subjects | |
| Description of the Instrument | |
| Procedure | |
| Study Design | |
| Methods of Analysis | |
| IV. RESULTS OF STUDY | 51 |
| V. CONCLUSIONS | 62 |
| Discussion of Results | |
| Conclusions | |
| Recommendations | |
LIST OF TABLES

1. Demographic characteristics of the wellness program employee participants at The University of Texas at Arlington, February 1990 to August 1990............. 52

2. Analysis by type of activity and number of activities per month.................. 53

3. Analysis of pre- and post-mean physiological variables.......................... 56

4. Results of ANOVA among risk groups showing significant physiological differences at pre-intervention assessment............. 57

5. Results of ANOVA among risk groups showing significant physiological differences at post-intervention assessment.................. 57

6. Results of 2 x 2 ANOVA between the different levels of at-risk participants from pre- to post-intervention.................. 59

7. Results of 2 x 2 ANOVA of physiological variables showing significant differences pre- to post-intervention between risk groups when aerobic exercise was chosen by the subjects of the Wellness Program at UT-Arlington, February 1990 to August 1990........................................ 60

8. Analysis of pre- and post-mean aerobic vs. anaerobic exercise of the Wellness Program at UT-Arlington, February 1990 to August 1990............................. 61
CHAPTER I

INTRODUCTION

The publication of Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention marked 1979 as the "birth year" of the work site health promotion movement (Chen, 1990). Healthy People identified priorities for improving the health of Americans and targeted the work setting as a venue for formal health promotion interventions. During the early 1980's workplace health promotion programs grew in popularity, primarily due to the rise in health care costs for the employer, increased absenteeism, low employee morale, and low job satisfaction (Chen, 1990). Results of the National Survey of Work Site Health Promotion Activities showed that by 1985, 65.8 percent of work sites with more than 50 employees had at least one health promotion activity (Health and Human Services, 1987). Types of health promotion programs included health risk assessments, smoking cessation, blood pressure control, exercise and fitness, weight control, nutrition education, stress management, back injury, and accident prevention (Health and Human Services, 1987).
O'Donnell defined work site health promotion as helping employees move toward a state of optimal health through a combination of efforts to enhance awareness, change behavior, and create environments that support good health practices (O'Donnell & Ainsworth, 1984). Even though the goal of most health promotion programs is to enhance the health of all employees, those classified as "high risk" based on physiologic measurements which exceed normal limits have the most to gain by participation in these programs (Yang, Lairson, Frye, Herd & Falck, 1988).

Active participation in health promotion programs is one of the key factors in helping employees make progress toward a state of optimal health. In general, about 20 to 30 percent of this group consistently participate in health promotion programs (O'Donnell and Ainsworth, 1984). Ten to 15 percent of employees are "joiners", or perpetual self-improvers who will enroll in a program regardless of its quality. Five to 15 percent of a work site population will likely never join a program regardless of its quality. The remaining 70 to 85 percent are undecided and can probably be influenced by many factors, which may include demographic and socioeconomic characteristics, current health practices, physical or economic barriers, and outcome expectancies (Lovato and Green, 1990).

Although there is evidence of many benefits of work site health promotion programs, it is necessary to gain a
better understanding about subpopulations of employees, particularly those workers classified at higher risk. These workers experience a greater number of medical claims, or are absent more frequently from their jobs, yet have a higher potential to attenuate their health risk status (Yang et al., 1988). Previous research indicates these "higher risk" individuals who are most in need of a work site health promotion program are the least likely to take advantage of such an opportunity to reduce their risk status, which places them at a greater chance of premature morbidity and mortality (Yang et al., 1988). If involved, however, such persons tend to exhibit varying levels of participation adherence. Additionally, reports in the literature tend to reflect on the larger, for-profit private industry or company programs.

These health promotion programs expanded to several workplace settings, including colleges and universities nationwide. Institutions of a higher education are in a unique position to implement health promotion programs for faculty, staff and students because they have personnel with a variety of educational specialities at their disposal to recruit the college community in both the initial stages of a program and the continuation of the health education effort (Puglisi, 1989).
Statement of the Problem

To determine from pre-existing data, whether university faculty/staff exposed to a seven-month cardiovascular risk reduction intervention are able to effectively reduce their physiological risk characteristics based on level of risk, adherence pattern, and type of activity chosen.

Purposes of the Study

This study was designed to determine the effectiveness of an employee intervention program utilizing pre-existing data collected by a university program. Specifically, the purposes of this study were to:

1. Identify general physiologic and program attendance characteristics of work site employees participating in a university wellness program.
2. Identify physiologic differences between and within the different levels of at-risk participants before and after a seven-month work site health promotion program.
3. Assess physiologic differences between and within the different levels of at-risk participants based on participation status in the exercise component of the fitness program.
4. Assess physiologic differences between and within the different levels of at-risk participants based on the type of fitness activity chosen by the employee.
5. Determine if individuals identified at "higher risk" for cardiovascular disease adhere more to a structured exercise program when compared to "lower risk" persons.

Hypotheses of the Study

The following six null hypotheses were considered in this study:

1. There will be no overall significant physiological changes from pre- to post-intervention assessment between "higher" and "lower" risk participant groups exposed to a seven-month work site health promotion program.

2. There will be no overall significant changes from pre- to post-intervention assessment within "higher" and "lower" risk participant groups exposed to a seven-month work site health promotion program.

3. Differences in overall physiological health status changes from pre- to post-program intervention will not be significant between "high-adherence" subjects (≥75% participation) and "low-adherence" subjects (<75% participation).

4. Differences in overall physiological health status changes from pre- to post-program intervention will not be significant within "high-adherence" subjects (≥75% participation) or "low-adherence" subjects (<75% participation).
5. There will be no overall significant physiological differences between the "higher" and "lower" participant groups based on the type of fitness activity chosen by the subject.

6. There will be no overall significant physiological differences within the "higher" and "lower" risk participant groups based on the type of fitness activity chosen by the subject.

Significance of the Study

Today’s health problems indicate it is necessary to bring about positive changes in associated lifestyles and behaviors. The current leading causes of death are primarily chronic, debilitating illnesses such as heart disease, cancer and strokes. In many cases, these afflictions may be viewed as diseases of choice because they may be a direct or indirect result of individual lifestyle choice (Chandler, 1985).

Incorporating health education/prevention into university health promotion programs is one avenue that can hopefully encourage these changes. Faculty and staff of universities can benefit by taking advantage of health promotion programs offered at the work site. The deleterious effects of spiraling health care costs are not limited to larger for-profit corporations. Throughout the United States inflation and increased usage of health care
benefits is a problem that most institutions of higher education are also experiencing (Puglisi, 1989).

A university setting provides many unique opportunities for health promotion activities that are not readily available to private organizations, although the availability and quality of such programs at institutions of higher education is only a recent phenomenon. Indeed, the availability of recreational facilities, trained professionals and student interns at many institutions of higher education increases the viability of health promotion programs. Additionally, there are greater opportunities for the application of effective teaching methodologies, practical experience for students and research endeavors (Evans, Harris, McNeill, McKenzie, 1984).

Even though previous studies indicate that participants in work site health promotion programs tend to be healthier than non-participants (O'Donnell & Ainsworth, 1984; Lovato & Green, 1990), little investigation has been done at universities isolating different sub-groups of at-risk participants involved in a health promotion program. High risk people are important targets of such programs, and they have the most to gain by controlling their elevated risk factors. Because the workplace has so many advantages as a setting for health promotion programs, and by studying the employees within these programs who are considered "higher risk", an evaluation of such efforts...
should help in developing programmatic activities to aid employees in moving toward an "optimal" level of well-being.

Limitations of the Study

The wellness program under investigation is an existing on-going program. Because secondary data was analyzed, the following limitations should be noted:

1. Randomization of subjects was not possible and choices of data items to be assessed were limited.
2. The initial level of fitness of the program participants was unknown.
3. Program staff who administered the participants' height and weight were different at the pre- and post-intervention periods, potentially reducing the reliability of these assessments.
4. There was no control group in which to make comparisons.
5. The results of this study pertain to a program at a single university, therefore limiting any extrapolations of these findings to other higher education population.
6. Generalizability of results to the total employee population is limited because only those employees who had complete data were included in the study.

Assumptions

This study utilized pre-existing data of a university faculty/staff wellness program. Some of this information
was established during the employees initial registration into the program. Specific assumptions were made:

1. The data on the employees age, sex, job, and class attendance was self-reported and is accepted as reliable.

2. The physiological data from the blood analyses (triglycerides, total serum cholesterol and High-density lipoprotein), the blood pressure and resting pulse measures are considered reliable in that they were measured by the same team of persons for the pre- and post-intervention tests using commonly recognized professional methods.

3. The employees reported honestly and accurately on how often they exercised and what type of activity they performed.

4. The coding of data was done by the program director.

Definition of Terms

"Higher Risk" Employees of the University Health Promotion Program

"Higher Risk" employees are defined as those participants whose pre-intervention screening results (two or more risk factors) exceeded "normal limits" on their physiological measurements. Normal limits were defined by Yang et al. (1988) which include systolic blood pressure (greater than 140 mmHg); diastolic blood pressure (greater than 90 mmHg); resting pulse (greater than 72 beats per minute);
triglycerides (greater than 170 mg/dl); total serum cholesterol (greater than 220 mg/dl), and high density lipoproteins (females less than 55 mg/dl, males less than 45 mg/dl).

"Lower Risk" Employees of the University Health Promotion Program

"Lower Risk" employees are defined as those participants whose pre-intervention results did not exceed "normal limits" on less than two (i.e. more than one) of their physiologic measurements and health practices (Yang et al., 1988).

Program attendance

Program attendance was divided into "High adherence" and "Low adherence" groups. The high adherence group consisted of persons who participated in program exercise activities at 75 percent or more of their personal program objective, (three times per week for 45 minutes each workout at a minimum of 9 workouts per month). The lower adherence group was comprised of faculty and staff participants who exercised less than 75 percent of their personal objective (Moxley, 1988).

Type of Exercise

Employees were able to select their activity in the program. Bicycling, aerobic dance, jogging, swimming and walking were considered "aerobic" cardiovascular
activities. The remaining activities, bowling, racquetball, volleyball and weights were considered "anaerobic" non-cardiovascular exercise.
CHAPTER II

REVIEW OF LITERATURE

The review of literature focuses on five areas which are specifically related to this research study. The first area to be discussed is the rationale for work site programs. The second area covers the reasoning for assessing higher risk populations at work site health promotion programs. Next, examples of successful health promotion programs will be presented. The fourth area will detail the criteria for determining higher risk employees based on physiological measures and program attendance/exercise as a standard for work site health promotion programs. Finally, the review will focus on the status of current university health promotion efforts.

Work Site Health Promotion Programs

Trends, attitudes, knowledge of risk, and technological expertise have combined to make the prevention of disease and the promotion of health and well being the optimal means for improvement in the general health of the American people (Metarazzo, 1984). The goals established in the landmark publication Healthy People: The Surgeon Generals Report on Health Promotion and Disease...
Prevention (Public Health Service, 1979), and the specific objective identified to achieve these goals promulgated in Promoting Health-Preventing Disease: Objectives for the Nation (Harris, 1980), underscored a national commitment by the federal government to improve the health of all Americans by preventing premature morbidity and mortality and promoting wellness. The successful attainment of these goals was based on the premise that there would be an active effort at all levels (national, state, and local) to implement health promotion activities (Tupper, 1989).

At the local level evidence suggests that the work site has several key features which support its role as a venue for health promoting activities (Everly & Feldman, 1985). First, the work site provides access to more than half of the adult population. Figures indicate that more than 100,000,000 people are employed in the United States, and the number of people working has steadily increased during the past five decades (Everly and Feldman, 1985). There is potential to indirectly reach a majority of the population through employees' influence on their families as well.

A second advantage of the work site is its accessibility, as employees spend 30 to 50 percent of their waking time at work (O'Donnell & Ainsworth, 1984). Barriers such as lack of convenience or lack of time negatively influence engagement in health practices; thus it is important to attempt to reduce such barriers
(McCullock, 1988). Also, employee populations are "semicaptive" in that they return to the same site on a daily basis (Hallett, 1986).

Stability is a third work site feature that enhances the success of employee health programs. The majority of the workforce is stable so work site programs can utilize long term intervention strategies and evaluations (Girdano, 1986). This is particularly important if the goal of health promotion activities is to establish lifetime positive health habits affecting chronic diseases. Long term support and regular periodic evaluations should reinforce this focus. For example, early detection of high serum cholesterol levels may reduce coronary heart disease, so ongoing work site cholesterol screenings may reduce soaring health care cost for the treatment of cardiovascular illnesses (Puglisi, 1989).

The work site has the potential, also, for providing a supportive physical and social environment for maintenance of a healthy lifestyle (O’Donnell & Ainsworth, 1984). O’Donnell noted in a recent article that the supportive environment is probably the most important factor in producing lasting health changes (O’Donnell, 1989). Because the goal of any health promotion program is usually long-term health benefits for the employees, a surrounding which nurtures continuing healthy lifestyles should enhance the success of this goal.
Higher Risk Populations and Work Site Wellness Programs

Many employers have increasingly looked to wellness programs to improve the health of their employees, in part due to the tremendous increase in employee health care costs related to worker health status. From the standpoint of the employer, a salient feature of many major diseases and disease groups is that they are preventable and/or postponable to a significant degree. Employers are discovering the increased cost of a "higher risk" employee; one whose behaviors and health status tend to make them pre-disposed to chronic or communicable diseases. The direct and indirect costs of the top three leading causes of death and disability are estimated to cost employers billions of dollars yearly. Thus, there is a strong financial incentive for employers to prevent, or at least slow the occurrence of these afflictions among their workers (Fielding, 1984), although greater numbers of retirees may deplete the pension system more.

A sedentary lifestyle has been implicated as a risk factor for a number of health problems among employees; a main reason why employers are instituting health promotion programs (Bjurstrom, 1978). Regular participation in exercise programs can lead to significant reductions in weight, improved measures of fitness (e.g. lower resting heart rate, faster pulse recovery rate after exercising and better performance on standardized fitness tests),
decreases in systolic and diastolic blood pressures, and reduced skin fold thickness which is a good measure of percentage of body fat (Bjurstrom, 1978).

Evidence of the benefits of vigorous sustained exercise includes reducing risk for heart disease. Research supports the contention that more physically active individuals have a lower age-specific rate of myocardial infarctions and associated deaths than their sedentary counterparts, even when all other confounding measures (e.g., blood pressure, smoking status, etc.) are held constant. For example, a prospective incidence study of Harvard Alumni found that those expending fewer than 2000 calories at work and play each week had a 64% higher risk of heart attack than the more active subjects (Paffenbarger, Wing, Hyde, 1978). Sisovick et al. (1982) and Blair et al. (1989) found that the risk of dying of a heart attack with no prior indication of heart disease was 55 to 65% lower in persons who engaged in at least a minimal amount of high-intensity leisure time activities during the prior year. This protective effect may be mediated by an exercise-induced increase in high density lipoprotein (HDL), which appears to aid in removing fatty deposits from artery walls (Wood & Haskell, 1979).

Thus far, scientific investigation has focused primarily on reducing risk factors and health care costs associated with cardiovascular disease (Gibbs, Mulvaney,
Henes, 1985). A fundamental question is whether the programs reach employees who are deemed "at risk" for disease and disability? Unfortunately, little data are available to shed light on this issue. Most health promotion programs do not systematically collect and evaluate data that allow a comparison of participants and non-participants (Conrad, 1987).

Some of the early fitness programs were specifically aimed at "higher-risk" persons. Conrad (1987) has reviewed several studies in this area. An early pilot study to examine the effect of physical activity on cardiovascular risk among at-risk men aged 45 to 59 found that, compared with controls, subjects who participated reportedly did so because of a greater desire to feel better and healthier. At a "YMCA" centered coronary risk reduction program, investigators found that "joiners" were younger than nonjoiners, more likely to be retired or working part-time, and better educated. The investigators suggest that these programs draw people who are already committed to improving their health in these areas.

A few studies have focused directly on participation. A study of a fitness program for executives at Exxon which compared participants with eligible non-participants found participants tended to be generally younger, in better physical condition, smoked less and had significantly lower serum cholesterol and triglyceride levels,
as well as a lower prevalence of hypertension and coronary artery disease (Yarvote, McDonagh, Goldman, 1974). The authors concluded that participants were a self-selected "healthier" group. An evaluation of the Tenneco Health and Fitness program showed participants were slightly younger, less at risk according to their physiological measures, and had a lower preexisting rate of absenteeism. (Baum, Bernacki, Tsai, 1986).

Fielding (1984), in a summarization of several research findings, found differences between participants and non-participants in wellness programs. Although he did not provide specific evidence, he suggested that program participants are more likely to be nonsmokers, to be more concerned about their health in general, to be younger, and to be more knowledgeable about the health benefits of exercise than non-participants.

Within each work site are employees who are "joiners" or perpetual self-improvers who enroll in a health promotion program regardless of its quality (O'Donnell & Ainsworth, 1984). However, the majority of these people are usually active prior to joining, and many of those who do not voluntarily participate are at risk for premature disease. These higher risk individuals are an important target in a health promotion program because they have the most to gain (Yang et al., 1988). In a previous study by Yang and colleagues (1988), the results of a public school
wellness program showed people at higher risk (two or more risk factors) displayed significant improvements in seven of the nine health measurements (lower body fat, systolic blood pressure, diastolic blood pressure, resting heart rate, triglycerides, serum total cholesterol, and increased HDL level) as a result of regular exercise (greater than 45 minutes three times per week) for a six-month period. This investigation also found that up to 91 percent of people at higher risk gained adequate control of their elevated measurements and brought them back to within normal limits (Yang et al., 1984).

In summary, the research suggests participants are initially more likely to be nonsmokers, more concerned with health matters, perceive themselves in better health, and have a greater interest in physical activities, especially aerobic exercise, than non-participants. There is also evidence participants may use fewer health services and be somewhat younger than non-participants. Thus, the data indicate that program participants may be healthier than non-participants, raising the question of whether work site wellness programs attract those individuals deemed at high-risk for health problems. It is also evident, from limited findings, that these programs do attract a limited number of "higher risk" persons, whom may require a more focused strategy to increase participation and reduce their risk than is currently used by wellness programs (Conrad, 1987).
Because of a greater potential for physiological and health status improvements and subsequent medical health care costs, future studies should focus more on the at-risk employee in a work site setting.

Effectiveness of Work Site Health Promotion

In recent years, regular physical exercise has gained wide acceptance as one component of a healthful lifestyle. Because of the importance of health in job performance, many exercise authorities and health professionals have recommended that physical fitness programs be offered in the business setting (Pate & Blair, 1983). Although the development of the work site physical fitness program is a fairly contemporary phenomenon in the United States, research provides some insight into the effects of such programs on the health and job performance of workers (Pate & Blair, 1983). An example of a successful approach is the Johnson & Johnson LIVE for LIFE Program (Blair, 1983). In this program, changes in exercise participation and physical fitness were consistent across educational levels and job classifications (Blair, 1983). While men and younger individuals were somewhat more likely to change, women and individuals in older age categories also improved their fitness levels. This study suggests that with a well-designed program, improvements can be expected for most categories of employees (Pate & Blair, 1983).
The Tenneco Corporation has had a long-term commitment to employee fitness. In an analysis involving a sample of 517 employees, differences in health care costs and absenteeism were evaluated among exercisers and non-exercisers during the start up of the program. The mean annual total health care costs for exercisers were $561 compared to $1,003 for non-exercisers, and mean number of absentee (illness) hours were 47 for exercisers versus 69 for non-exercisers (Kaman, 1987). Tenneco also documented improved job performance among exercisers when compared to non-exercisers (Bernacki, 1987). The differences in all categories suggest a positive relationship between exercise participation and cost benefit, but no causal relationship was implied. Rather, the Tenneco program findings suggest a self-selection process in which individuals already committed to exercise may join a company such as Tenneco simply because of its support for employee fitness (Bernacki, 1987).

Mesa Petroleum Company showed results similar to those reported by Tenneco in that exercise adherents had fewer sick days and lower health care costs. In a cost-benefit analysis between 1982 and 1983, absenteeism savings ($\text{\$/employee}$) were only $156 in 1982 compared to $303 in 1983; total savings were $373 in 1982 versus $520 in 1983, and the amount recovered (\% savings/budget) was 76\% in 1982 versus 107\% in 1983. Thus, Mesa showed in its second year
an actual savings in estimated dollars by providing an employee fitness program. This study is an effective demonstration of cost/benefit analysis and provides strong support for establishing health promotion programs (Kaman, 1987).

In yet a fourth study with school employees, Pate and Blair (1983) found that teachers in three schools that comprised the treatment group improved their exercise participation and physical fitness compared with teachers in a control school. Thus, it seems reasonable to conclude that carefully designed exercise programs can produce real changes in exercise and physical fitness in populations of employees (Pate & Blair, 1983). If employees as a group improve their exercise participation resulting in improved health status, perhaps the company would benefit as well. It has been shown that work site fitness programs will reduce absenteeism and health care costs, improve employee attitude and job satisfaction, and generally increase productivity (Pate & Blair, 1983). For example, in the Canadian Life program, employees who successfully participated in an exercise program showed a five percent reduction in their medical care costs from the year before to the year following their introduction into the program compared to a 35 percent cost increase in a control company (Shephard, Corey, Renzland & Cox, 1982). The participants at Canadian Life also showed an almost 50 percent drop in
average absenteeism relative to the year prior to the fitness program (Cox, Shephard & Corey, 1981).

Other investigations find similar results. In an investigation with Prudential employees who exercised at least 2.5 times per week, a 20.1 percent reduction in average disability days and a 45.7 percent reduction in average major medical costs \( (m = \$262.15) \) from the pre-entry to the post-entry year was found (Bowne, Russell, Morgan, Optenberg & Clark, 1984).

In a long-term study of medical care of Los Angeles County Firefighters, workers' compensation costs per $100 of payroll were reduced 45% for participants during the first 10 years of the program. Compensation costs, particularly those for back injuries, were much lower for those firefighters who were more flexible and had more strength and physical work capacity versus those with the lowest physical work capacity (Cady, Thomas & Karwasky, 1985).

Insurance companies have also reaped the benefits of physical fitness programs at the work site. In a long term study at Blue Cross and Blue Shield of Indiana, the nearly five year difference in discounted average medical care costs between one cohort of program participants and a nonparticipant employee control group was $519.09. For each $1.00 in medical care costs spent on participating employees, $1.73 was spent on non-participating employees (Gibbs, Mulvaney, Henes & Reed, 1985).
The CIGNA Corporation initiated a fitness-based health promotion program for selected employees at its offices in Philadelphia. To test its impact on certain determinants of health status, physiological and blood work measurements were collected from 636 white-collar employee participants. Statistically significant improvements were found between pre- and post-intervention for each dependent variable (e.g., blood cholesterol, triglycerides, abdominal girth, pulse rate, and blood pressure) (Eddy & Beltz, 1989).

Bertera evaluated the effectiveness of a comprehensive workplace health promotion program on absenteeism among full-time employees in a large, multi-location diversified industrial company. A pre-test/post-test control group design was used to study 41 intervention sites and 19 control sites with 29,315 and 14,573 hourly employees, respectively. Blue-collar employees at intervention sites experienced a 14.0 percent decline in disability days over two years compared to a 5.8 percent decline at control sites, which resulted in a net difference of 11,726 fewer disability days over two years at program versus non-program sites. Savings due to lower disability costs in the first year provided a return of $2.05 for every dollar invested in the program by the end of the second year (Bertera, 1990). These findings suggest that comprehensive workplace health promotion programs can reduce disability
days among blue collar employees and provide a good return on investment.

Criteria for Determining Higher Risk Employees

Physical activity and physical fitness are associated with various measures of improved health in clinical observations. Cooper and colleagues reported that men with higher levels of physical fitness are at lower risk for coronary heart disease (Cooper, Pollock, Martin, White, Linnerund & Jackson, 1976). More-fit men have lower serum cholesterol, triglyceride, glucose, and uric acid levels and they also exhibit reduced blood pressures, cholesterol levels and body fat. Similar results were reported for women patients at the Cooper Clinic in Dallas, Texas (Gibbons, Blair, Cooper & Smith, 1983).

Blair and others (1989) studied fitness and activity levels with risk of all-cause and cause-specific mortality rates. Their results showed a strong and consistent inverse relationship between physical fitness and mortality in men and women. Their finding was not due to the confounding effects of age or other risk factors. Moderate levels of physical fitness that are attainable by most adults appear to be protective against early mortality. The specificity of this effect is evidence that is largely limited to reduced rates of cardiovascular disease and cancer deaths in the more-fit men and women. (Blair, Kohl, Pagenbarger, Clark, Cooper and Gibbons, 1989).
As stated earlier, researchers have long understood the relationship between exercise and cardiovascular fitness, but only recently has the effect of less than maximal physical activity on health status been examined (Blair et al. 1989). Guidelines developed over ten years ago by the American College of Sports Medicine recommend that a healthy adult undertake 20 to 60 minutes of rhythmic exercise using the large-muscle groups, three to five days a week, at 60 to 90 percent of maximum heart reserve (American College of Sports Medicine, ACSM, 1990). This set of recommendations has almost become a litany among exercise experts, but its appropriateness for all adults is at the core of the health versus fitness debate (Monahan, 1987). According to Freedson, reported by Monaham, (1987), strict adherence to the ACSM position may alienate the very people who most need to exercise, i.e., people who are already at higher risk. She further states "if physicians and health promotion coordinators are prescribing exercise exclusively on the basis of ACSM guidelines then the unfit, the people on the road to cardiovascular disease, and the obese (higher risk individuals) are not going to last long in any fitness program even at the work site" (Monahan, 1987, p. 182). According to Dr. Peter B. Raven, professor of physiology at the Texas College of Osteopathic Medicine, pinning exercise down to an exact amount isn’t relevant. "What we’re interested in is defining workouts that are
low, moderate, or high intensity. If low-intensity workouts are beneficial, then that's what should be used; especially with people who are at higher risk initially" (Monahan, 1987, p. 182). In addition, Blair et al. (1989) did find in their research that people at higher risk who attempt lower to moderate exercise/activity (i.e., vigorous vacuuming, climbing stairs, brisk yard work, leisurely walking after dinner) can show some overall improvements in reduction of coronary heart disease (CHD) and improved physiologic measurements. Since results have been conclusive, hopefully more people including employees at health promotion programs, might engage in exercise activities.

University/College Health Promotion Programs

Corporations and businesses are not the only organizations that have recognized the effectiveness of health promotion at the work site. Many universities and colleges have established wellness/health promotion programs for students and/or their faculty and staff employees (Leafgren & Elsenrath, 1986; Warner, 1984). It has become increasingly evident that institutions of higher education have discovered significant dollars can be saved when health promotion programs are provided for faculty and staff as well for students (Ward, 1988).

One of the first university health promotion programs was developed at the University of South Carolina, which
has a very comprehensive wellness program for faculty, staff and students. The Faculty/Staff Wellness Project which has now been in existence for over twelve years was originated with the purpose of improving employee health knowledge, self responsibility, and the adoption of health promotion behaviors (Love, Lamkin & Morphis, 1982). Early evaluation of the project showed participation in the program resulted in increases in health knowledge, reported feelings of vigor and decreased feelings of tension, anger and confusion. Not only have there been positive changes in "Quality of Life" measures, but positive changes were also seen in a number of physiological variables. There were significant decreases in weight, percent body fat, diastolic blood pressure, and total serum cholesterol. There were also significant improvements among participants in measures of pulmonary function and vital capacity (Love et al. 1982; Warner, 1984). Due to the positive results of this innovative program, the Faculty/Staff Wellness Project Model was adopted by South Carolina Blue Cross/Blue Shield Company (Love et al., 1982; Warner, 1984).

The University of Maryland - Baltimore County (UMBC) promotes wellness in a variety of ways. The university constructed a fitness trail designed to develop the four components of total fitness: flexibility, muscular endurance, strength and cardiovascular endurance (UMBC, 1983). The trail has several exercise stations and is
designed to be a self-paced training facility. Through the cooperation of several campus agencies, the Fitness Trail became a frequently used, popular facility on the UMBC campus (Warner, 1984). Another wellness promotion strategy at UMBC offered by the Health Service is the "Be Healthy" Series. This is for students, staff and faculty or area citizens who are interested in staying well or improving their health (University of Maryland, Baltimore County, 1982).

James Madison University has also performed extensive wellness promotion, with major emphasis on a program titled "Superperson," sponsored by the Division of Student Affairs. "Superperson" consists of a week's activities directed toward familiarizing students and faculty with the basic dimensions of wellness: mind, body and spirit. The response to the first "Superperson" in 1978 was very positive; over 2300 students and faculty participated in the programs (Warner, 1984).

More recently, in October, 1990, Oklahoma State University opened the doors of its new 24,000 square-foot Wellness Center devoted solely to health promotion program activities. The center services 18,000 students, 4,000 faculty and staff members and the off-campus community. Various health screenings, fitness programs, and classes on a variety of subjects are offered. Success, as defined by financial and behavioral change measures of the facility,
has been attributed to their qualified staff, support of the administration and representation of the various employee bodies (McCrory, 1990).

The University System of New Hampshire has used a variety of resources on each of its campuses to establish a comprehensive and nationally recognized health promotion program for its faculty and staff. The Exercise for Lifelong Fitness (ELF) program began in 1982 as a pilot program. It includes a health education component as well as exercise classes (Puglisi, 1989). Information obtained from confidential health risk appraisals has been used to develop specific programs to aid in healthier lifestyle choices (e.g. weight control classes, smoking sensation, AIDS education, exercise programs and stress management seminars).

The ELF program possesses the traditional qualities of most health promotion programs in the work place; however, programming has evolved beyond the services generally offered to employees. In an attempt to control health care costs ELF offers cholesterol testing and mammography screening for their faculty and staff members free of charge and at the work site, thus ensuring early detection, intervention, and follow-up for associated health problems (Puglisi, 1989).

Although figures on cost effectiveness have not been analyzed, it is assumed that with the number of faculty and
staff members participating in the various programs, steps toward lifestyle changes have been undertaken. Puglisi believes it is through the educational process that we can inform, advise, motivate, detect and provide intervention strategies to assist faculty and staff members with positive life-style changes.

Montana State University (MSU) faced a crisis in providing medical insurance benefits to its employees in 1984. Through a carefully planned and developed self-insurance program, the university adopted a health promotion/wellness program to help aid employees and their families maintain their health and to limit the growth of medical costs (Evans, Harris, McNeill & McKenzie, 1984).

In 1984 a voluntary employee wellness program was designed and implemented at MSU. It offered health risk appraisals, medical screenings, and five exercise activity classes. From the initial startup in 1984 until 1988, the MSU wellness program grew significantly in size and scope (Evans et al., unpublished data, 1984). MSU used a questionnaire in order to ascertain the needs and interests of the employees. Additional programs are now offered, including personal conditioning, outdoor activities, orthopedic exercises, health education, nutrition classes, weight control, stress management skills and an increased number of exercise fitness classes. Currently MSU's Employee Wellness Program offers blood chemistry health
screenings, body fat analysis, blood pressure measurements and screenings for colon and breast cancer.

The general program goals were to improve overall health status resulting in better control over health care costs to participants of the MSU wellness program. Since the beginning, there have been gradual increases in the number of participants enrolling in the various programs. Preliminary data suggests a decrease in medical care costs; however, evaluation of the program's impact in relation to the program objectives is accomplished in a variety of ways. The data base for program participants is generated from self-reported information taken from a questionnaire and the clinical data measured and recorded by program personnel. Evaluation on the program's impact on productivity, absenteeism, and health risk factors from the data are being assessed and results will be made available when the research is completed.

At the Rochester Institute of Technology (RIT), Rochester, New York, the goals of wellness have been incorporated in a comprehensive program designed to positively influence the development of the whole person (Chandler, 1985). The RIT wellness program began in 1985 with a target population of 16,000 college students. More than 1,000 of these students are hearing impaired, and are enrolled through the National Technical Institute for the Deaf (NTID), one of the nine RIT college campuses. NTID is
the world's only national technical college for the hearing impaired (Chandler, 1985).

The RIT wellness committee provides wellness oriented programs throughout the year and serves as a resource for students, faculty and staff. The program includes using questionnaires to evaluate students lifestyle habits. Exercise classes are offered, and students are encouraged to work at their training heart rate level 3-4 times per week for 10 weeks; at least 20-30 minutes each time. Students learn to monitor their resting and training heart rates. To measure the effect of the exercise program on their heart rate, students take an ergometer fitness test administered by a local cardiovascular fitness specialist at the beginning and end of a ten-week period. Students receive feedback in the form of individual graphs showing test results before and after the ten week exercise period (Chandler, 1985).

One of the more prominent health promotion initiatives is at the University of Wisconsin-Stevens Point (UWSP). Launched in 1972, the program is devoted to lifestyle improvement. The task was initiated by the staff of the Student Life Division of university services with specific missions and program goals (Hettler, 1980). Students and faculty/staff are eligible to participate in the program.

Today, the university and the school of Health, Physical Education, Recreation, and Athletics (HPERA) are
partners in developing educational experiences for students and staff (Munson, Abbott, Hettler, 1991). Students as well as staff can become qualified in skills such as facility management, exercise programming, nutrition, stress management, modifying addictive behaviors and environmental wellness programming. Students and faculty can earn college credit which combines lectures, discussions, and experiences related to the student's own seven dimensions of wellness (Munson et al., 1991).

The UW-Stevens Point Health Promotion/Wellness program has been very unique in comparison to other college wellness programs in that it was one of the first wellness programs to originate. The positive benefits and results have been achieved through the hard work of committed leaders working side by side to improve the health status of individuals on campus and in the Stevens Point Community.

Ball State University (BSU) has taken a slightly different approach to their wellness program, which was initiated in 1982, but laid dormant until 1985 (Warren, 1990). At that time, a forty member task force created both a graduate program in Wellness Management and the Institute for Wellness. The task force is comprised of various university, business, service and medical personnel. Their main focus, campus wide, was developing programs that included psychology, physiology of exercise,
health science, physical education, business principles, and a nationwide focus on health promotion and disease prevention (Warren, 1990).

The Wellness Institute at Ball State presently is housed in a new twenty-nine million dollar Health/Physical Activity complex. All university populations are eligible to be part of the health promotion program, which includes students, faculty, staff, family and community. The institute not only consists of all the usual exercise and health/wellness activities, but students have the opportunity to attend education classes which faculty and staff may also participate in. A Family Wellness Series is offered for the families of BSU faculty, staff and students. Community activities include cooperative arrangements with the local schools, YMCA's, health boards and hospitals within an initiative called the Live Healthy Delaware County Project (Warren, 1991).

The Institute for Wellness truly serves the individual, the family and the community. It's goals, set in 1985, of developing a graduate program in wellness, offering wellness research opportunities, and being a leader in health promotion throughout the state, region, and nation, either have been met or are currently in the process of being achieved. BSU has one of the largest health promotion programs at the university level which should yield a visibly well-prepared crop of health professionals
to meet the needs of an ever increasing "wellness-aware" nation in years to come (Warren, 1991).

Michigan State University (MSU) is another example of a successful university/college health promotion program which, according to results from the recent surveys, has shown a positive trend toward better health for its participants. A comparison of survey findings shows that employees, students and retirees have become more health conscious since 1987. Named "Healthy U", and begun in the mid 1980's, the program was charged with supporting and promoting the efforts of units across campus to help MSU's populations experience good health. As the program increases and strengthens, future plans at MSU include coordinating and supporting health promotion activities in order to link programs and thus build a strong university network, support and enhance educational activities and offerings related to health promotion, and disseminating information related to health promotion. In addition, MSU's Healthy U will evaluate their program to make the strongest impact on the health of university members, build on the diversity of target populations, and serve as a consultant group as MSU responds to health-related legislature requirements (Furry, 1991).

The Boston University (BU) Wellness Center was founded in May, 1990, as one result of efforts by the Boston University Substance Abuse Task Force. In addressing
campus concerns about alcohol and other drugs, the task force decided to adopt a proactive, comprehensive approach rather than a more reactive "just say no" principle. After its founding, the center rapidly grew to address other important life issues. The six-dimensional wellness model (social, occupational, spiritual, physical, intellectual, and emotional) is the philosophical foundation of the wellness center with prevention, education, and health promotion as its central tenets (Mansergh, 1991).

In the year the center has grown, collaborative efforts have been facilitated with other offices, departments, student leaders, and organizations in an effort to build campus community ownership and commitment to wellness and healthy lifestyles. The center focuses on two areas: wellness/health promotion and drug prevention. Within each area many resources and facilities are available to the faculty, staff and students of Boston University. Other preventive programs and services are underway for the future, including enhanced graduate assistant and internship experiences (Mansergh, 1991).

The University of Arizona's health promotion program has been in operation for just over a year. The program is available to both employees and students for a minimum charge and offers blood pressure and fitness assessments, diet analysis, weight management, sports medicine and exercise rehabilitation consultations. Each semester
programs are offered in aerobic conditioning, weight training, aquatic fitness, health education lectures and health fitness assessments (Warren, 1991).

After more than a year, the university wellness program staff are evaluating its status and offering more services. In comparing numbers of people who participated in specific services from the fall of 1990 to the summer of 1991, participation has increased. This was due in part to many graduate and older, nontraditional students who are utilizing the wellness center services (Warren, 1991).

The University of North Texas (UNT) recently conducted a survey, gathering relevant information regarding Texas university and college wellness programs. The purpose of Fridinger and Arm's (1991) survey was to compare and analyze existing Texas university wellness programs with UNT's program. A thirty-eight item survey elicited replies to questions on demographics, program characteristics, budget issues, staffing concerns, program activities, physiological assessments offered and types of program evaluation. All types of higher education were represented, however, most responses came from public and private four-year universities/colleges and junior/community colleges.

The findings in this study displayed both the strengths and weaknesses of health promotion programs in colleges and universities throughout Texas. In addition, those results
concluded that less than half the institutions that responded had designated programs on campus. Those that did survived on small budgets, had limited or part-time directors and lacked administrative support. According to their results, more emphasis is needed on program evaluation (Fridinger & Arms, 1991).

It is clear from the various programs just cited that wellness continues to be a strong area of interest on university campuses. The wellness phenomenon also appears to be more than a "fad". Its position in the student services can continue to be enhanced by the integration of wellness theory with that of student development and the application of wellness principles for students, faculty, and staff throughout the university and college community (Emmerling & Elsenrth, 1987).

As mentioned earlier, many colleges/universities have recognized the potential benefits of health promotion-wellness programs for faculty/staff, students and other affiliated populations. Several wellness programs were outlined, but there are many more universities/colleges with current fitness/health promotion programs. Most of these wellness promotion efforts are enjoying success; however, the majority of the reported results were inferred from limited data, students, faculty or staff anecdotal reactions, and program reports - not from scientific
research. In order to determine the effectiveness of these programs, more objective scientific research is needed.

SUMMARY

The five areas just discussed are specifically related to this research study. As was mentioned, work site health promotion programs are increasing in popularity, with research indicating the need for these programs to be available to "all" work site employees. However, programs should focus on a variety of organizations, including colleges/universities, and not just the larger for-profit companies. Within this population, the focus should be to target the "at risk" population, since they have the most to gain by a health promotion program in reducing their chances for preventing morbidity and mortality. However, a health promotion program's ultimate goal should be prevention and awareness for everyone whether they are classified "at risk" or not.
CHAPTER III

METHODOLOGY

The purpose of this study was to assess, using pre-existing data, the physiological health status differences between different levels of "at-risk" participants before and after a seven-month exercise intervention at a local university wellness program. In particular, an examination of these physiological differences between the different levels of at risk participants was based on type of fitness activity chosen by the employee, and adherence to an organized exercise program.

Selection Of Subjects

The study population was comprised of 88 employees who were new members of the wellness program at a metropolitan university in the North Texas area. Sixty eight of the participants were females and 20 were males. Ages of participants varied from 25 to 60 years. Mean age for females was 38.3 and males was 43.5. The subjects were selected because they had complete data records at both the pre- and post-intervention assessment periods that included their health status measurements, number of workouts they attended per month and type of activity they performed.
Instrumentation

The instruments used for data collection in this study were divided into three phases. The first area consisted of the subjects' blood lipid profiles. After completing a twelve hour fast, participants' blood specimens were obtained using venapuncture taken by a registered nurse at the university's health center. All of the serum analyzed was interpreted by an external full service laboratory licensed by the State of Texas and certified by the College of American Pathologists. The blood profiles measured total serum cholesterol, triglyceride, low density lipoprotein (LDL) and high density lipoprotein (HDL) levels.

Blood pressures and resting pulse rates were assessed at both pre- and post-intervention by the Director of the Wellness Program. The blood pressures were measured to the nearest millimeter by an Exactus II aneroid sphygmomanometer and stethoscope. Systolic and diastolic blood pressures were taken in the left arm and determined by Phase I and Phase V Korotkoff's sounds. The participants were seated for five minutes prior to the blood pressure screening. The employees' resting pulse was checked using the employees' left wrists and the beats were counted for a full sixty seconds.

The employees also completed a health check profile questionnaire eliciting their names, ages, and past medical
history. At the last station the subjects' heights and weights were determined. Weight measurements were determined to the nearest half pound (shoes and jackets removed) by the health center's scales, and their heights were determined to the nearest millimeter (shoes and hats removed). Both measures were recorded on the participants' health check profiles.

Procedures

The university wellness program initially was implemented as a pilot study during the 1988-89 academic year with continuance and/or expansion to all employees contingent upon evaluation results. The Student Affairs Department was chosen to participate by the university president because the Research and Evaluation division is that department's responsibility. Within the pilot study, the employees of the Student Affairs Department were selected to participate on a volunteer basis. The pilot program goals and objectives were established and a total of 50 staff employees elected to participate. Participants were offered full range of fitness/aerobic activities once the blood work and enrollment forms were completed. Physiological measures were evaluated before and after a seven-month exercise intervention program (February 1989 to August 1989). Positive improvements in reducing risk factors were found. For example, both the male and female
participant groups made significant strides in reducing their mean scores for both total serum and LDL cholesterol. HDL levels increased over the time frame, and mean body fat decreased significantly for both males and females. In addition systolic and diastolic blood pressures, resting heart rates, and high cholesterol levels declined, although the decrease was not statistically significant. An evaluation of the data conclusively indicated that the goals, and most of the objectives, were achieved. Additionally, participants reported on evaluation forms using a Likert scale and answered they improved on physical well-being, reduced stress and showed greater health-related knowledge. The university received dividends in terms of reduced employee turnovers (Moxley, 1989).

Because of the overall positive benefits associated with the pilot study, the university initiated and began a comprehensive university wellness program during the 1990-91 academic school year which is available to all faculty/staff members of the university. All employees were initially notified of the wellness program through advertisements and departmental meetings. Participants joined the health promotion program for a one-time $10.00 fee, with an additional cost of $5.00 for each blood profile each year thereafter. All other expenses were incurred by the university. Release time from work (up to 1 1/2 hours per week) was allowed to increase employee
participation. Before actual program participation began, each employee was asked to sign a liability release form for the university and complete a brief medical history questionnaire. Also a mandatory physical evaluation was administered which included an assessment of weight, blood pressure checks and blood chemistry testing. Participants were assured of confidentiality of these test results. The employees received a copy of their blood results within two days. One copy went into the file kept in the office of the coordinator under lock and key, who had exclusive access to participants’ screening information.

All fitness program participants were then encouraged to attend a pre-program meeting where they were presented written and oral information concerning proper fitness training, the importance of warm-up exercises, available program activities (i.e., low-impact aerobics, jogging, swimming, walking, weight-training) and the policies and procedures associated with the program. Individuals also had the option of choosing to exercise on their own. Full-time employees were eligible for up to one and one-half hours of release time each week for participation in the physical fitness program. To ensure that these policies were upheld, the participants in the program notified their job supervisors when leaving and checked in at the designated areas in the Recreation Building as they began their fitness activities for the day.
Upon completion of the participants' initial enrollment forms, and the return of their blood profiles (usually within two days) each individual employee was counseled by the director of the program. Individuals stated their specific goals for the program and were informed of incentives/awards that could be earned upon reaching these goals. Incentives such as workout bags, t-shirts and towels were awarded at the end of each semester (Fall, Spring and Summer) for 75% to 100% of completed workouts. Each employee's goal was to work out a minimum of three days a week for 45 minutes each workout. Participation was measured with the use of a monthly participation log sheet (Appendix). The employees were instructed to fill out their log sheets each time they worked out. They entered the date, name, activity performed, place of workout, and length of time exercised. At the end of each month this information was compiled for each participant and recorded onto a computer software program which assessed the frequency of each employee's workouts and the type of exercise performed each month. In order to maintain participation in the program, an employee must have exercised 75% of the time and followed program procedures described earlier. If not, they are dropped from the program.

In February of 1990, interested employees were allowed to enroll in the program and instructed to follow the proper policies and procedures. After seven months,
reliability of assessments was assured since all protocol measures, except height and weight, were taken in an identical manner by the same staff personnel or laboratory. Height and weight were taken by a different staff person at the post-program screening. A total of 88 out of a possible 288 participants were included in this study because they had complete data records on all measures.

Study Design

The research methodology chosen for this investigation was quasi-experimental since randomization of subjects was not possible due to utilization of pre-existing data. The design is a two group (higher and lower risk) pre-test and post-test. The intent of this study was to analyze existing pre- and post-intervention physiological measures of the employees with exercise being their intervention during that seven-month period. These groups were chosen because of the number of subjects who had \( \geq 2 \) \((n=41)\) and \(< 2 \) \((n=47)\) of the possible nine risk factors assessed at the pre-intervention screening. The Yang et al. (1988) study also grouped subjects according to these numbers of risk factors. In that study the higher risk group consisted of subjects with two or more risk factors and the lower risk group were subjects with less than two risk factors, as described earlier in Yang’s et al. (1988) six-month study of at-risk participants using exercise as the intervention.
Dependent variables include weight, systolic and diastolic blood pressure, resting pulse rate, triglycerides, total serum cholesterol (TCHOL), high density lipoprotein level (HDL), low density lipoprotein level (LDL), and a coronary risk ratio (TCHOL/HDL).

The independent variables include the participants' age, sex, physiological health risk status (higher-risk/lower-risk), amount of exercise per month (higher/lower adherence) and type of exercise per month. Diagram A shows a depiction of the design of the study.
DIAGRAM A
DESIGN OF PROJECT

FEBRUARY 1990

Study Sample
Pre-Intervention Assessment
Subjects (1) Physiologic Higher Risk => 2 Risk Factors
N = 88 TCHOL N = 41
Male = 20 HDL Male = 8
Female = 68 LDL Female = 33
-TCHOL/HDL
-Triglycerides
-Rest Pulse
-Blood Pressure
-Weight
(sys/dia)

SEPTEMBER 1990

7-Month Intervention

1) #times worked Post-Intervention Assessment
out per month (1) Physiologic
a) higher program
adherence => 75%
-TCHOL
-HDL
-LDL
-TCHOL/HDL
-Triglycerides
-Rest Pulse
-Blood Pressure
-Weight
(sys/dia)

b) lower program
adherence <= 75%
2) Type of
activities per
month
Data Analysis

All data was analyzed using the SAS statistical software package. Individual files were transcribed onto a numerical data set at the university. Two types of analyses were conducted. A descriptive statistical summary, including means, standard deviations, frequency distributions, and minimum and maximum scores were calculated for each variable of each risk among groups. This analysis was used because of the descriptive nature of the study.

A second analysis included a two-way Analysis of Variance (ANOVA) technique for each of the dependent variables. The purpose of this test was to assess differences for each individual dependent variable based on the main effect of group (i.e., higher risk/non-higher risk), the main effect of the program (i.e., pre-test/post-test) and the interaction between group and program while controlling for initial differences between groups. The confidence level for rejection of the null hypotheses was p<.05.
CHAPTER IV

RESULTS OF STUDY

The purpose of this study was to assess, using pre-existing data, the effectiveness of an intervention program at reducing cardiovascular health risks of employees participating in a local university wellness program. Analyses were made on the physiological differences between and within different levels of at-risk participants based on the type of fitness activity chosen, along with an assessment of whether higher-risk employees have better adherence to organized exercise programs compared to lower risk employees.

Demographic Characteristics

The study population were members of a health promotion program at a local university. The subjects were chosen because they had complete data records of their health status measurements, number of workouts attended per month, and type of activity they performed on file between both the pre- and post-intervention assessment periods. Table 1 shows the demographic characteristics of the subjects by total, risk, and adherence groups. Most of the subjects were staff members (n=82, 93%), with a majority being female (n=68, 77%). Ages ranged from 25 to 60 with means of 38.3 (1.25) for females and 43.5 (1.09) for males.
Table 1

Demographic characteristics of the wellness program
employee participants at the University of Texas at

<table>
<thead>
<tr>
<th></th>
<th>Total Group</th>
<th>Risk Group</th>
<th>Adherence Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>41</td>
<td>47</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Female</td>
<td>68</td>
<td>33</td>
<td>35</td>
</tr>
<tr>
<td>Employment Category</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty</td>
<td>6</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Staff</td>
<td>82</td>
<td>39</td>
<td>43</td>
</tr>
<tr>
<td>Age (m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>43.5(1.0)</td>
<td>42.4(1.2)</td>
<td>41.6(1.1)</td>
</tr>
<tr>
<td>Female</td>
<td>38.3(1.2)</td>
<td>39.1(1.1)</td>
<td>37.5(1.0)</td>
</tr>
</tbody>
</table>

For the total group, as well as males and females, there is a greater number of subjects in the lower risk category and for total group and males in the higher adherence group.

Table 2 shows the number and types of activities, as well as the mean number of activities per month, for the total, risk and adherence groupings. During the seven month intervention, the majority of the subjects (n=73 or 82%) chose some type of aerobic/cardiovascular exercise as their primary activity. The remaining fifteen subjects (18%) chose an anaerobic/non-cardiovascular exercise. Results were similar for both risk and adherence groups. The average number of activities per month tended to increase over the first three to four months of the
intervention period for the total group and then remained fairly consistent thereafter. A similar activity pattern was found among those in the higher and lower risk and adherence groups. Also, July was the only month the higher risk group met their objective (>75% adherence or 9 workouts/months) possibly due to having more time to work out. As expected, higher adherence corresponded to a greater mean number of activities per month. The lower risk group had the greatest number of activities per month.

Table 2

Analysis by Type of Activity/Number of Activities per Month

UT-Arlington Wellness Program, February 1990 to August 1990

<table>
<thead>
<tr>
<th>Type of Activities</th>
<th>Total Group (sd)</th>
<th>Risk Group Higher</th>
<th>Lower</th>
<th>Adherence Group Higher</th>
<th>Lower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biking</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bowling</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Aerobic Dance</td>
<td>30</td>
<td>13</td>
<td>17</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Jogging</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Racquetball</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Swimming</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Volleyball</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Walking</td>
<td>36</td>
<td>18</td>
<td>18</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Weights</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

Activities Per Month

<table>
<thead>
<tr>
<th></th>
<th>m (sd)</th>
<th>m (sd)</th>
<th>m (sd)</th>
<th>m (sd)</th>
<th>m (sd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>February</td>
<td>7.57(4.2)</td>
<td>6.82(3.5)</td>
<td>8.23(4.6)</td>
<td>9.95(3.8)</td>
<td>4.85(2.8)</td>
</tr>
<tr>
<td>March</td>
<td>9.90(5.9)</td>
<td>8.85(5.7)</td>
<td>10.82(5.9)</td>
<td>13.02(5.7)</td>
<td>6.34(3.7)</td>
</tr>
<tr>
<td>April</td>
<td>10.92(6.2)</td>
<td>8.92(5.4)</td>
<td>12.65(6.3)</td>
<td>14.36(5.8)</td>
<td>6.97(3.9)</td>
</tr>
<tr>
<td>May</td>
<td>11.32(9.6)</td>
<td>8.85(6.8)</td>
<td>13.48(11.1)</td>
<td>17.31(9.1)</td>
<td>4.46(3.8)</td>
</tr>
<tr>
<td>June</td>
<td>10.14(9.0)</td>
<td>8.51(6.3)</td>
<td>11.57(10.7)</td>
<td>16.12(8.0)</td>
<td>3.29(3.7)</td>
</tr>
<tr>
<td>July</td>
<td>11.87(9.7)</td>
<td>9.63(7.6)</td>
<td>13.82(11.0)</td>
<td>18.08(8.5)</td>
<td>4.75(5.0)</td>
</tr>
<tr>
<td>August</td>
<td>10.20(9.1)</td>
<td>8.82(7.5)</td>
<td>11.40(10.3)</td>
<td>15.97(8.1)</td>
<td>3.58(4.7)</td>
</tr>
</tbody>
</table>
Analyses of Physiological Variables Pre- to Post-
Nine dependent variables were measured pre- and post-
tervention. Table 3 represents the physiological data
for the pre- and post-means among the total, risk, and
adherence groupings. An analysis of variance was also
performed to determine significant differences pre- to
post-intervention between and within the risk and
adherence groups (Tables 4, 5, 6, 7).

The results of Table 3 show the higher risk group
improved on seven of the nine measures assessed at post-
tervention: weight, resting heart rate, LDL, total
serum cholesterol, systolic/diastolic blood pressure, and
coronary risk ratio. The lower risk group showed
improvement on five of the nine measures; weight,
resting heart rate, systolic blood pressure, LDL, and
total serum cholesterol. Also, as expected the higher
adherence group improved on seven of the nine measures at
the post-intervention assessment: weight, resting heart
rate, systolic/diastolic blood pressure, LDL, total serum
cholesterol, and coronary risk ratio) compared to the
lower adherence group showing improvement on five of the
nine measures: weight, resting heart rate, LDL, total
serum cholesterol, and triglycerides.

Table 4 shows the ANOVA results indicating
significant differences between the higher and lower risk
groups at the pre-intervention assessment. Higher risk
subjects had a greater mean weight (+23.16 lbs), resting heart rate (+9.65 bpm), systolic blood pressure (+10.64 mmHg), total serum cholesterol (+31.22 mg/dl), triglycerides (+28.18 mg/dl), and coronary risk ratio (+2.34) when compared to their lower risk counterparts. When comparing risk group physiological mean values at the post-program intervention seven months later, (Table 5), the higher risk subjects still had significantly elevated total serum cholesterol (35.44 mg/dl), systolic blood pressure (8.19 mmHg), lower density lipoproteins (LDL), (25.06 mg/dl), triglycerides (6.77 mg/dl), resting heart rate (6.89 bpm) and coronary risk ratio (1.13).
Table 3

Analysis of pre- and post-mean physiological variables
UT-Arlington Wellness Program, February 1990-August 1990

<table>
<thead>
<tr>
<th></th>
<th>Higher</th>
<th>Lower</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre (sd)</td>
<td>Post (sd)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>*171.56 (39.7)</td>
<td>167.07 (38.6)</td>
</tr>
<tr>
<td><strong>RHR</strong></td>
<td>*80.39 (9.7)</td>
<td>**74.97 (9.9)</td>
</tr>
<tr>
<td><strong>SYS.BP</strong></td>
<td>*131.29 (16.8)</td>
<td>**128.48 (14.2)</td>
</tr>
<tr>
<td><strong>DIAS.BP</strong></td>
<td>79.90 (11.9)</td>
<td>79.02 (8.5)</td>
</tr>
<tr>
<td><strong>LDL</strong></td>
<td>153.07 (37.3)</td>
<td>**149.82 (36.2)</td>
</tr>
<tr>
<td><strong>HDL</strong></td>
<td>55.48 (19.3)</td>
<td>51.90 (14.9)</td>
</tr>
<tr>
<td><strong>TCHOL</strong></td>
<td>*236.53 (37.5)</td>
<td>**232.63 (40.7)</td>
</tr>
<tr>
<td><strong>TCHOL/HDL</strong></td>
<td>*5.54 (5.5)</td>
<td>**4.77 (1.4)</td>
</tr>
<tr>
<td><strong>TRIGLY</strong></td>
<td>*168.75 (82.2)</td>
<td>**169.26 (89.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Higher</th>
<th>Lower</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre (sd)</td>
<td>Post (sd)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>158.25 (32.0)</td>
<td>155.91 (30.7)</td>
</tr>
<tr>
<td><strong>RHR</strong></td>
<td>74.06 (12.4)</td>
<td>70.38 (10.8)</td>
</tr>
<tr>
<td><strong>SYS.BP</strong></td>
<td>126.27 (14.9)</td>
<td>122.97 (13.5)</td>
</tr>
<tr>
<td><strong>DIAS.BP</strong></td>
<td>76.85 (11.2)</td>
<td>76.57 (7.7)</td>
</tr>
<tr>
<td><strong>LDL</strong></td>
<td>144.31 (33.8)</td>
<td>138.51 (33.7)</td>
</tr>
<tr>
<td><strong>HDL</strong></td>
<td>59.04 (18.4)</td>
<td>52.65 (15.0)</td>
</tr>
<tr>
<td><strong>TCHOL</strong></td>
<td>222.36 (38.4)</td>
<td>213.12 (41.8)</td>
</tr>
<tr>
<td><strong>TCHOL/HDL</strong></td>
<td>4.86 (5.3)</td>
<td>4.29 (1.3)</td>
</tr>
<tr>
<td><strong>TRIGLY</strong></td>
<td>115.19 (87.8)</td>
<td>127.87 (134.2)</td>
</tr>
</tbody>
</table>

NOTE: *Significant differences between pre-intervention mean values among the higher and lower risk groups.
**Significant differences between post-intervention mean values among the higher and lower risk groups.
Table 4

Results of ANOVA Among Risk Groups showing significant physiological differences at pre-intervention assessment.

UT-Arlington Wellness Program, February 1990 - August 1990

<table>
<thead>
<tr>
<th>Physiological Variable</th>
<th>df</th>
<th>f</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>2,85</td>
<td>4.99</td>
<td>.0089</td>
</tr>
<tr>
<td>Resting HR</td>
<td>2,85</td>
<td>9.38</td>
<td>.0002</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>2,85</td>
<td>6.56</td>
<td>.0022</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>2,85</td>
<td>6.77</td>
<td>.0019</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>2,85</td>
<td>8.38</td>
<td>.0005</td>
</tr>
<tr>
<td>TCHOL/HDL (CRR)</td>
<td>2,85</td>
<td>5.75</td>
<td>.0045</td>
</tr>
</tbody>
</table>

Table 5

Results of ANOVA Among Risk Groups showing significant physiological differences at post-intervention assessment.

UT Arlington Wellness Program, February 1990 - August 1990

<table>
<thead>
<tr>
<th>Physiological Variable</th>
<th>df</th>
<th>f</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>2,85</td>
<td>5.31</td>
<td>.0067</td>
</tr>
<tr>
<td>Lower density lipoprotein (LDL)</td>
<td>2,85</td>
<td>7.06</td>
<td>.0015</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>2,85</td>
<td>9.41</td>
<td>.0002</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>2,85</td>
<td>5.11</td>
<td>.0080</td>
</tr>
<tr>
<td>Resting HR</td>
<td>2,85</td>
<td>6.31</td>
<td>.0028</td>
</tr>
<tr>
<td>TCHOL/HDL (CRR)</td>
<td>2,85</td>
<td>12.55</td>
<td>.0001</td>
</tr>
</tbody>
</table>
Table 6 displays the significant differences between the higher and lower risk groups from pre- to post-intervention (time effect). Significant improvements were found for eight of the nine physiological variables; triglycerides, low-density lipoprotein (LDL), weight, resting heart rate, systolic blood pressure, coronary risk ratio (TCHOL/HDL) and total serum cholesterol.

In addition, findings were minimal when studying the changes within the different levels of at-risk participants from pre- to post-intervention. The results indicated a significant decrease in the lower risk group's resting heart rate only. When comparing both the lower and higher risk groups to see if there was a difference from pre- to post-intervention, only the lower risk group had comparatively significantly reduced their HDL, LDL, and weight measures. There was no significant findings group by time interaction pre- to post-intervention assessment.
Table 6

Results of 2 x 2 ANOVA between the different levels of at-risk participants from pre- to post-intervention at the University of Texas at Arlington, February 1990 to August 1990.

<table>
<thead>
<tr>
<th>Physiological Variable</th>
<th>df</th>
<th>f</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>1, 86</td>
<td>14.42</td>
<td>.0003</td>
</tr>
<tr>
<td>HDL</td>
<td>1, 86</td>
<td>5.29</td>
<td>.0239</td>
</tr>
<tr>
<td>LDL</td>
<td>1, 86</td>
<td>10.96</td>
<td>.0014</td>
</tr>
<tr>
<td>Weight</td>
<td>1, 86</td>
<td>8.76</td>
<td>.0040</td>
</tr>
<tr>
<td>Resting HR</td>
<td>1, 86</td>
<td>22.10</td>
<td>.0001</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>1, 86</td>
<td>14.66</td>
<td>.0002</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>1, 86</td>
<td>9.35</td>
<td>.0030</td>
</tr>
<tr>
<td>TCHOL/HDL (CRR)</td>
<td>1, 86</td>
<td>15.69</td>
<td>.0002</td>
</tr>
<tr>
<td>TCHOL</td>
<td>1, 86</td>
<td>16.99</td>
<td>.0001</td>
</tr>
</tbody>
</table>

There were no significant differences between or within the high and low adherence groups at pre- or post-intervention assessments.

Table 7 displays the significant physiological differences between the higher versus lower risk groups, from pre- to post-intervention, when aerobic activity is chosen. Significant improvements were found for all nine physiological risk measures when the subjects chose aerobic exercise (i.e., swimming, aerobic dance, jogging, walking and bicycling). There were no significant findings when the subjects chose anaerobic activities (i.e., bowling, volleyball, weight lifting and racquetball), although improvements were made at post-intervention assessment in
triglyceride, resting heart rate and systolic blood pressure levels. There were few significant results within group or group by time interaction. There were only three significant results of the higher and lower risk groups when aerobic activity was chosen (increased HDL level; reduced LDL and RHR), and when anaerobic activity was selected only HDL and total serum cholesterol improved, regardless of the risk group.

Table 7

Results of 2 x 2 ANOVA of physiological variables showing significant differences pre- to post-intervention between risk groups when aerobic exercise was chosen by the subjects of the Wellness Program at UT Arlington, February 1990 - August 1990.

<table>
<thead>
<tr>
<th>Physiological Variable</th>
<th>df</th>
<th>f</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>1,71</td>
<td>8.48</td>
<td>.0048</td>
</tr>
<tr>
<td>HDL</td>
<td>1,71</td>
<td>5.05</td>
<td>.0277</td>
</tr>
<tr>
<td>LDL</td>
<td>1,71</td>
<td>14.73</td>
<td>.0003</td>
</tr>
<tr>
<td>Weight</td>
<td>1,71</td>
<td>5.88</td>
<td>.0179</td>
</tr>
<tr>
<td>Resting HR</td>
<td>1,71</td>
<td>13.19</td>
<td>.0005</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>1,71</td>
<td>9.15</td>
<td>.0035</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>1,71</td>
<td>6.80</td>
<td>.0111</td>
</tr>
<tr>
<td>TCHOL</td>
<td>1,71</td>
<td>16.47</td>
<td>.0001</td>
</tr>
<tr>
<td>TCHOL/HDL (CRR)</td>
<td>1,71</td>
<td>13.46</td>
<td>.0005</td>
</tr>
</tbody>
</table>

The results of Table 8 shows the aerobic activity group improved on seven of the nine measures assessed at post-intervention: weight, resting heart rate, LDL, total serum cholesterol, systolic/diastolic blood pressure, and coronary risk ratio. The anaerobic activity group showed
improvement on five of the nine measures; weight, resting heart rate, LDL, total serum cholesterol, and triglycerides. As expected, there were greater improvements when the subjects chose aerobic-type activities, since they can reduce disease risk the most.

Table 8

Analysis of pre- and post-mean aerobic vs. anaerobic exercise of the Wellness Program at UT-Arlington, February 1990 to August 1990

<table>
<thead>
<tr>
<th>Measure</th>
<th>Higher Risk Group</th>
<th>Lower Risk Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre (sd)</td>
<td>Post (sd)</td>
</tr>
<tr>
<td>Weight</td>
<td>153.56( 31.9)</td>
<td>151.27( 30.3)</td>
</tr>
<tr>
<td>RHR</td>
<td>75.63( 11.9)</td>
<td>70.93( 8.8)</td>
</tr>
<tr>
<td>SBP</td>
<td>124.90( 14.9)</td>
<td>122.76( 12.3)</td>
</tr>
<tr>
<td>DBP</td>
<td>76.79( 10.3)</td>
<td>76.43( 8.3)</td>
</tr>
<tr>
<td>LDL</td>
<td>140.36( 37.6)</td>
<td>37.6 ( 33.2)</td>
</tr>
<tr>
<td>HDL</td>
<td>62.08( 17.7)</td>
<td>55.69( 14.1)</td>
</tr>
<tr>
<td>TOTCHOL</td>
<td>218.30( 44.5)</td>
<td>213.30( 40.8)</td>
</tr>
<tr>
<td>TRIGL</td>
<td>113.83( 93.2)</td>
<td>122.09(125.2)</td>
</tr>
<tr>
<td>TCHOL/HDL</td>
<td>4.25( 4.3)</td>
<td>4.02( 1.2)</td>
</tr>
</tbody>
</table>
CHAPTER V

DISCUSSION OF RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was designed to determine the effectiveness of an exercise intervention program for employees utilizing pre-existing data collected by a university health promotion program. Specifically, the purposes included identifying general physiologic measurements and program attendance characteristics of work site employees participating in a university wellness program, and assessing physiological differences of at risk participants based on type and frequency of activity.

The following six null hypotheses were considered for this study:

1. There are no significant differences in physiological changes between the higher and lower risk participant groups from pre- to post-intervention assessment when exposed to a seven-month work site health promotion program.

2. There are no significant changes within the higher and lower risk participant groups from pre- to post-intervention assessment when exposed to a seven-month work site health promotion program.
3. Differences in physiological health status changes from pre- to post-program intervention are not significant between "higher adherence" participants (≥75% adherence) or "lower adherence" participants (<75% adherence).

4. Differences in physiological health status changes from pre- to post-program intervention are not significant within "higher adherence" participants (≥75% adherence) or "lower adherence" participants (<75% adherence).

5. There are no significant physiological differences between the different levels of at-risk participants based on the type of fitness activity chosen by the subject.

6. There are no significant physiological differences within the different levels of at-risk participants based on the type of fitness activity chosen by the subject.

Discussion of Results

There were significant physiological changes between the different levels of at-risk participants exposed to a seven month workplace health promotion program at the post-intervention assessment. The post-intervention measures that were significantly reduced were triglycerides, lower density lipoprotein (LDL), total serum cholesterol, resting heart rate, systolic blood pressure and coronary risk ratio
(TCHOL/HDL). In addition, there were significant differences between the higher and lower risk groups from pre- to post-intervention on all nine physiological variables assessed: triglycerides, high-density lipoprotein (HDL), low-density lipoprotein (LDL), weight, resting heart rate, systolic blood pressure, diastolic blood pressure, and coronary risk ratio (TCHOL/HDL). Because of these significant findings, the first null hypothesis is rejected at the p<.05 level of confidence.

Only minimal results were found when studying the changes within the different levels of at-risk participants. Only a reduction of the lower risk groups’ resting heart rate was uncovered. Finally, in looking at the interaction between the higher and lower risk groups from pre- to post-intervention, the lower risk group showed significant results on HDL, LDL, and weight only. Because of relatively large standard deviation scores, more significant group by time interactions were not found. Some of these results were similar to the at-risk participants of a public school wellness program Yang and his colleague’s studied (Yang et al., 1988). Yang used t-tests to compare the differences between measurements at pre- and post-test. The results of their six month study showed seven of the eight physiologic measurements changed in the expected direction and were statistically significant (p<.005). These included percentage body fat,
systolic blood pressure, diastolic blood pressure, resting pulse, triglycerides, and total serum cholesterol. For people at higher risk (two or greater physiologic measurements exceeding normal limits), six of the seven measures showed significant improvements. Furthermore, the changes were biologically significant (i.e., measurements were brought to within normal limits). Therefore, non-significant changes in the physiological variable within each risk group did not precipitate rejection of the second null hypothesis at the $p<.05$ level.

The differences in physiological health status changes from pre- to post-program intervention were not significant between or within the "higher adherence" ($\geq 75\%$ adherence) and "lower adherence" ($<75\%$ adherence) groups; therefore the null hypotheses were accepted.

Finally, there were significant physiological differences between the different higher and lower risk groups from pre- to post-intervention due to the subject's choice of activity. All nine physiological measures improved when the subjects chose aerobic exercise; but only triglycerides, resting heart rate, and systolic blood pressure significantly improved when the subjects chose anaerobic exercise.

These data results are comparable with other researchers' findings. Pate and Blair (1983) found that physiological goals were attained with programs that
provided 20 - 30 minutes of moderate intense "aerobic" activity three or more days per week. Therefore, these two null hypotheses were rejected at the .05 alpha level. These results are similar to the findings from the study by Yang and colleagues (1988) which showed subjects who chose aerobic exercise experienced significantly greater physiologic improvements from those who chose anaerobic exercise at the end of six months (Yang et al., 1988). Wyness (1990) also found positive physiologic improvements in his study of adults who engaged in a 12-week moderate exercise program requiring the maintenance of training state exercise heart rates for a minimum of 20 minutes, three times a week.

To summarize, the first, second, fifth and sixth hypotheses were rejected while hypotheses three and four were accepted.

Conclusions

1. The health promotion program at this university appears to be an effective strategy at reducing "at-risk" or elevated physiological health status levels among participants, especially when aerobic activity is chosen.

2. Continuing to have an exercise intervention program, especially one that emphasizes aerobic exercise, can have an impact on employees in targeting the higher-risk population in that they especially can reduce their chances for premature morbidity and mortality. These
findings confirmed those of Yang and his colleagues (1988) with the public school employees, as well as with Wyness (1990) and Blair et al. (1989) studies of higher risk participants.

3. Adherence to exercise programs needs to be further researched. In this study, although there were no statistically significant results, there was an overall trend in the positive direction from pre- to post-intervention. Other studies have, however, found significant changes. Using multiple regression analysis, Yang et al. (1988) found statistically significant modifications on subjects' percentage body fat, systolic/diastolic blood pressure, resting heart rate, triglycerides and total serum cholesterol. In Wyness' (1990) study, selected physiological effects improved during a twelve-month moderate exercise program, including blood pressure, resting heart rate and percentage body fat. Leith and Taylor (1989), in a review of experimental research literature relating to exercise adherence, found some programs with improved program attendance, although the results did not prove to be statistically significant in many cases. Dishman (1988), has also pointed out this serious concern to the health practitioner. "Our conceptual understanding of exercise adherence undergoes continual refinement: our ability to translate these
findings into workable guidelines has remained relatively static and continued research is necessary."

Recommendations

1. University wellness programs should continue to focus on behavioral risk factor education, and in particular, target the "at-risk" population, mainly because they have the most to gain.

2. More scientific research is needed to evaluate the effectiveness of university health promotion programs.

3. Research is needed to determine if an optimal time frame for follow-up and retesting of employees' physiological measurements can help maintain positive behavioral changes.

4. Additional research on "at-risk" employees' adherence level to an exercise program is needed.

5. Health promotion programs should encompass "aerobic" activities more so than "anaerobic" exercise, since aerobic-types of exercise reduces disease risk the most.
APPENDIX

UNIVERSITY WELLNESS PROGRAM PARTICIPANT LOGSHEET
UTA Wellness Program

Participation

Please sign in as follows:

<table>
<thead>
<tr>
<th>DATE</th>
<th>NAME</th>
<th>ACTIVITY</th>
<th>PLACE</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Team Leaders, please return to Margie, Box 19268, Activities Bldg.

Thank you.
BIBLIOGRAPHY


Leith, Larry M., Taylor, Adrian H., 1989, "Behavior modification and exercise adherence: a literature review, University of Toronto, School of Physical and Health Education, Toronto, Canada.


Love, M., Lamkin, R., & Morphis, L. (1982). "Wellness Works!", University of South Carolina. (Unpublished manuscript available from University of South Carolina Office of Health Promotion.)


Physical activity as an index of heart attack risk

wellness program at the university system of New

The influence of an employee fitness and lifestyle
modification program upon medical care costs. *Canadian
Journal of Public Health,* 73, 259-263.

and primary cardiac arrest. *Journal of American
Medical Association,* 248, 3113-3117.

2000 National Health Objectives. *American Public
Health Association 117th Annual Meeting October 22-26.
Chicago, IL.

*National Survey of Worksite Promotion Activities:
A Summary.* Office of Disease Prevention and Health
Printing Office.


