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An analysis of health related physical fitness measurements and absenteeism of employees participating in worksite wellness program

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AN ANALYSIS OF HEALTH RELATED PHYSICAL FITNESS MEASUREMENTS AND ABSENTEEISM OF EMPLOYEES PARTICIPATING IN A WORKSITE WELLNESS PROGRAM

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CHAPTER 1

Introduction

Management of business and industry is recognizing the significance of preventive healthcare at the worksite. By establishing wellness programs for employees within the company walls, management is gambling that programs such as aerobic exercise, fitness testing and health education programs can alter the health, absenteeism and mental attitude of today's employee and decrease the need for serious medical intervention.

Involvement of business and industry within the wellness movement is still in the formative stages. It has only been through intuitive projection, calculated guessing and extrapolation from similar situations that the pioneer developers in the field of wellness have been provided with sufficient justification for investing corporate resources in wellness programs for employees (O'Donnell, 1984).

In the past decade, corporate America's attitude has shifted from one of almost absolute acquiescence to the medical profession to one of recognizing the valuable, but very small part that medicine plays in determining our own health (Goldbeck, 1984). This new attitude represents a shift in values that has extended from our concepts of health to a new definition of employee benefits. A recent Harris Poll found that 92% of the public supports the

statement that:

> If Americans lived healthier lives, ate more nutritious foods, smoked less, maintained proper weight and exercised regularly, it would do more to improve our health than anything doctors and medicine could do for us (Goldbeck, 1987).

Fitness in business supports the notion that if positive lifestyle habits such as those mentioned in the Harris Poll were incorporated into the worksite, absenteeism, productivity, work related injury and medical care costs could be improved to the benefit of both employer and employee. The introduction of fitness and lifestyle programs provides an opportunity to derive possible sources of financial as well as humanitarian benefits from the development of worksite wellness programs. Management of business and industry is seeking ways in which to control acute increases in medical care costs and escalating employee absenteeism. It has been argued that an employee fitness program could generate substantial savings through a parallel reduction in the direct and indirect costs of ill health (medical bills and absence) (Shephard, 1987). The financial burden is evident. Detailed analysis of 1981 medical care costs estimated that over $300 billion was spent for employee absenteeism and of that amount over half was spent to treat preventable conditions. At the current rate of escalation it is predicted that the costs will double every five years (Baun, 1983).

The focus upon cost savings for companies is based on

the positive associations between exercise and health, and primarily decreased rates of cardiovascular disease (Bowne, 1984). Exercise, in the form of participation in an employee wellness program has been related to decreased sick hours and absenteeism, decreased visits to physicians, enhanced productivity, morale and ultimate reduction of health care costs. The association between exercise and the quality of individual health, although not absolutely conclusive is responsible in part for improvement in lifestyle, both on and off the job (Bowne, 1984).

Management leaders in business and industry are becoming aware of rising medical care costs and employee absenteeism and that evidence is available which suggests that positive life style habits can correct illness absenteeism. Due to this union of exercise and business, new strategies involving wellness programs are being developed to solve the problems associated with unhealthy employees.

Statement of the Problem

The purpose of this study was to evaluate the physical fitness and absenteeism comparisons between exercising and non-exercising employees who participate in worksite wellness program.

Subproblems

The following subproblems were identified:

1. Will employees who voluntarily participate within a worksite wellness program undergoing fitness testing show a significant difference in physical fitness at pre-test phase between exercising and non-exercising employees?

2. Will employees who voluntarily participate within a worksite wellness program undergoing fitness testing and who exercise show a significant difference in physical fitness at post-test phase?

3. Will employees who voluntarily participate within a worksite wellness program undergoing fitness testing and do not exercise show a significant difference in physical fitness at post-test phase?

4. Will employees who voluntarily participate in a worksite wellness program including fitness testing show a significant difference in physical fitness at post-test phase between exercising and nonexercising employees?

5. Will employees who exercise show a lower average amount of sick hours than non-exercisers?

Importance of the Study

Health is no longer being defined as just the absence of disease, but rather as the optimal attainable state of well-being of body, mind and spirit. Health promotion programs are designed to help employees alter unhealthy behavior and effect a change in lifestyle. The worksite is

the place where these programs will have the greatest impact on the present adult population. The employer has as much at stake as the employees (O'Donnell, 1984).

Experts at the Center for Disease Control discovered that 48% of U.S. mortality is due to unhealthy behavior or lifestyle (Ainsworth, 1984). Wellness programs are designed to help employees change specific poor behavior into positive and productive behavior. Employers are citing wellness as a humanitarian approach to solving the conflicts involved with poor health by providing such programs as health education, behavior modification, fitness and health risk assessment, exercise and cardiovascular conditioning, in addition to a myriad of other self-care oriented services. Through such on-the-job health choices, employees can learn to identify their own personal health needs, to determine significant risk factors such as high blood pressure, elevated cholesterol or excess weight, and to work towards changing poor health habits for the better.

Wellness programs provide an education and support environment necessary for maintaining a change in lifestyle. They aid the individual in identifying health risks, then teach them how to modify behavior to eliminate those risks. Moreover these programs introduce the employee to the concept of wellness (Ainsworth, 1984).

On the other hand, management too can acknowledge potential advantages to worksite wellness progamming.

Health promotion can have a major impact on the image of the organization. Such advantages range from enhanced company visibility, recognized concern between management and employees and probable cost savings in terms of decreased absenteeism, work related injury and increased productivity (O'Donnell, 1984).

If there is a significant relationship between the health status of today's employee and absenteeism, we can begin to quantifiably measure and determine the potential influence of exercise and positive lifestyle on long term illness and disease.

Delimitations of the Study

The following delimitations applied to this investigation:

1. Only full-time employees of the Foster Farms Turkey Production Plant were used for this study group. Employees who were laid off for an extended period were eliminated as part of the study group.

2. All fitness testing was completed on company time and was confidential and completely voluntary.

3. Absenteeism records as provided by the Foster Farms personnel department were collected for each individual within the study groups. Records were charted for a one-year period starting three months prior to fitness pre-testing and terminating three months after fitness post-testing.

Statement of Hypothesis

Various studies and research projects have yielded inconclusive results with regards to the benefits of physical fitness and reduction of absenteeism. Therefore, the following hypotheses were developed:

1. There will be no significant difference at pre-test phase in physical fitness between exercising and non-exercising employees who participate within the worksite wellness program and undergo fitness testing.

2. There will be no significant difference in physical fitness at post-test phase for employees who voluntarily participate in physical fitness testing and continue to exercise.

3. There will be no significant difference in physical fitness at post-test phase for employees who voluntarily participate in physical fitness testing and do not exercise.

4. There will be no significant difference in physical fitness at post-test phase between exercising and non-exercising employees who participate within the worksite wellness program undergoing fitness testing.

5. Employees who exercise will not have a lower level of illness absenteeism than non-exercisers who participate within the worksite wellness program undergoing fitness testing.

Assumptions

The following assumptions were made in this study:

1. It was assumed that for those testing parameters which required physical exertion, maximum effort and best performance was exhibited by the test subject.

2. It was assumed that each participant answered truthfully in response to questions regarding daily exercise habits.

3. It was assumed that absenteeism or sick hours records were accurate.

4. It was assumed that each test subject completely understood the function and purpose of each phase of testing and followed the instructions accordingly.

Definition of Terms

The following terms are defined in order to facilitate a better understanding of this study:

Exercising Study Group: Those employees who voluntarily participate in the fitness testing and who exercise three or more times per week for 20 to 60 minutes at 60% to 85% of their maximum heart rate. Exercise was self monitored or completed within one of the company's worksite aerobic programs.

Non-exercising Study Group: Those employees who voluntarily participated in the fitness testing but did not exercise on a routine basis, but reported sporadic participation in recreational activities throughout the

year.

Absenteeism: Absenteeism was the recorded number of employee sick hours.

Wellness: Wellness is an attitude towards the way an individual perceives his or her health status. It encompasses a total commitment to the importance of prevention in combating illness and injury, through exercise, proper nutrition and proper lifestyle habits, thereby keeping both body and mind physically and mentally fit.

CHAPTER 2

Review of the Related Literature

A new attitude towards employee benefits and health has been infused into business and industry. Approximately 50,000 business firms in the United States have programs promoting exercise to keep employees physically fit. Over the last decade there has been an unprecedented acceleration of the number of firms starting wellness programs. Management seems to perceive the usefulness of physical fitness programs as being a way to alter employee behavior and poor health ultimately resulting in organizational gains. (Driver, et al 1982)

Evolutionary Growth

The evolution of the health promotion concept has several generations of development. To gain a better understanding of this development it is necessary to earmark the various stages of program progress.

Initially health promotion was defined and recognized in terms of safety regulations and smoking policies. Those policies were instituted based largely on product quality reasons, not for health benefits of employees. Recreational programs have also existed for decades but were started for morale reasons as opposed to fitness (Goldbeck, 1984). The second generation emerged with the classic "executive

program." Management was the focus of preventive medical care while lower level employees had no system of in-house fitness opportunities. These executive programs utilized risk factor identification to single out specific illnesses.

Within the third generation, a more diversified and comprehensive range of health interventions were being introduced at the worksite. Not only did all levels of employees have access to the system, so did dependents and retirees.

This stepladder has led to the current system of establishing wellness at the worksite with both employees and employers recognizing the need to manage health problems (Goldbeck, 1984). Ultimately the common goal of each program is to impact the long term health status of employees, by changing their long term lifestyle practices (O'Donnell, 1984).

The content of employee wellness programs may vary in design from one to the next, however several basic components are consistent. Educational programs attempt to provide employees with information that they can use to improve their health. Evaluation screening is utilized to screen or test employees' physical fitness status to identify past, current and potential medical problems or risk factors. Such screenings could include diet analysis, stress levels, physical fitness, hypertension screening, medical history, cardiovascular risk factor identification

and multiphasic health screening.

Another program option is prescription programs. A prescription program combines the screening program with a personalized diet, exercise or health related education program. To support the conditions of the wellness program a behavior change support system is needed, however this is the most costly with only 20-30 companies nationwide offering such a system. This portion included facilities, equipment, staff, supervision and a support environment (O'Donnell 1984).

Health Benefits of Increased Exercise

There are both vocal opponents and advocates of the health potential of exercise. Their positions on the subject range from the belief that vigorous exercise is a panacea for all that ails man to the belief that it provides no health benefits and is a hazard to be avoided by every adult. (Perhaps the truth is to be found somewhere between these two extremes.) As with many other changes in health related habits, the scientific evidence that demonstrates a cause and effect relationship between a change in the habit and a reduction in the frequency or severity of health problems still is not definitive. On the other hand, there is substantial evidence that for some health and job related conditions, an appropriate increase in exercise primarily by previously inactive adults, can provide direct beneficial effects (Haskell, et al 1984).

One of the most renowned studies conducted by Dr. Lester Breslow of the University of California at Los Angeles, took place in Alameda County, lasted ten years and involved a scientific sampling of 7,000 adult men and women. The study showed that by observing a few positive health practices such as smoking cessation, sleep, exercise, alcohol restriction, maintaining proper weight and eating breakfast, a 45 year old man could be expected to live ten to eleven years longer than a person who did not make these choices. Women who observed these same health practices could expect to live seven years longer (Schweiker, 1981). Any fitness enthusiast would agree that exercise makes him feel and look better, allows him to work and play with less fatigue and better performance and reduces his frequency of illness, ultimately improving the quality of life both on and off the job.

Despite a lack of "hard evidence" establishing a cause and effect relationship between exercise and improved health, epidemiological data is the best available source of information on the protective effects of exercise against various medical conditions (O'Donnell, 1984). Most analysis of such data have demonstrated that exercise protects against Coronary Artery Disease. More active persons tend to have fewer heart attacks, when they do occur, such persons are older, and the attacks are less severe. Exercise may reduce the risk of heart attacks by

means of favorable alterations of biochemical and circulatory functions (Fox, et al., 1973). As with other heart disease risk factors such as blood pressure, cigarette smoking, high cholesterol and so forth, there is still mixed evidence that exercise will reduce heart disease morbidity (Haskell, 1980).

Looking better or improving the condition of the heart is the impetus behind individual exercise choices. The fitness ideal has quietly enlarged its place into the American psyche both on and off the job (Harris, et al., 1987). Just in the last two years, 25 million Americans started exercising for the first time, it's an improvement in fitness that has never been seen before and its increase should put to rest the notion that fitness is a fad or has already peaked (Harris, 1987).

The fitness movement encompasses several distinct fractions that interplay into each other to create a healthy wellness lifestyle. Some of the areas which can be altered by becoming involved with exercise include weight, joint mobility, strength and flexibility.

It is generally accepted that excess body weight is associated with increased morbidity and mortality. Modest amounts of exercise can significantly alter an individual's energy balance from negative to positive if aerobic exercise is properly prescribed. Decreases in metabolic rate can also be prevented by regular aerobic activity to allow

additional burning of calories and retention of muscle mass. Even a five percent decrease in metabolic rate with age can result in the potential to gain five to ten pounds of body fat per year at the same caloric intake (Haskell, 1980).

Orthopedic limitations can be reduced or alleviated if strength and flexibility exercises are appropriately selected as a part of a comprehensive exercise program (Gendell, 1987). Strength exercises to enhance abdominal muscle tone and stretching exercises to maintain lower back discomfort and disability are influential in reducing work related injuries. Increased muscular strength, greater joint flexibility and enhanced bone density as a result of proper exercise may provide protection to muscles and joints (Haskell, 1980).

Working to Trim Costs, Improve Health

One of today's primary liabilities in business and industry is poor employee health. It is estimated that the employer, corporate or government, pays 60% to 70% of the nation's bill for sickness and that this money comes directly from profits (Whitmer, 1984).

Companies from small to large are experiencing annual medical care increases of 20% to 80% in employee health care costs. This increase in part is due to the attitude that illness cannot be prevented. Conditions such as cancer, heart attacks, strokes, liver disease and other catastrophic diseases occur in a random and arbitrary way. Nothing is

further from the truth.

Correcting the health habits of employees can mean healthier employees as well as healthier budgets. A sampling of what companies have witnessed since the inception of worksite wellness programming include:

> New York Telephone saved $2.7 million dollars last year in absence and treatment costs due to its in-house wellness programs (Leroux, 1982).
>
> A hypertension progam saved $633,000 for the Canadian Life Assurance Company and $302,000 was saved for YMCA's healthy back program (Leroux, 1982).
>
> Kennecott Corporation found that 150 employees involved in its wellness program showed 52% better attendance on the job, a 75% cut in weekly indemnity costs and a 55% drop in health, medical and surgical costs (Sacramento Bee, 1982).
>
> Under the Stop Smoking Program at Dow Chemical, one quarter of the 33% of employees who smoked quit. Smokers there averaged 5.5 days more absenteeism, 7.7% more disability and 12% more illnesses per year than non-smokers (Leroux 1981).

Wellness Studies: Preliminary Investigations

Long term commitment to research of wellness progamming and its demonstration of effects have been randomly studied; however, verification and significant test results are presently in the formative stages of study.

Tara D. Knott of Evaluation Resources argues that one of the primary reasons current studies are "Mickey Mouse and tinker toy research," is that the field of corporate wellness needs evaluation studies to recognize the potential value of health promotion programs, because it is too

difficult to claim quantitative measurements (Knott, 1986). Walsh and Hingson reported that randomization of the treatment group is often difficult, primarily in the work environment, because management believes that random selection is unethical or impossible due to union or human rights constraints. The managers are right (Knott, 1986). In business and industry, such constraints and others exist and must be realistically cited. It is politically, morally and ethically wrong to withhold treatment from various persons and to make those persons comply with preplanned programs over a predetermined test period.

While some researchers believe that the tremendous amount of variability in the worksite makes it difficult to identify program worth, others would tend to disagree. Those programs which have established short to long term projects in wellness settings have established methods which take into account those variables. Through identification of limitations and restrictions, a wellness program can be judged, evaluated and reviewed for future perusal.

A sampling of three programs which have made the commitment to determining program effectiveness include the Tenneco Health and Fitness Program, Mesa Petroleum and Exploration Company and the Canadian Assurance Company. Each company has developed study groups by which to evaluate absenteeism, significant changes in physical fitness and cost effectiveness to management.

Preliminary Investigation

Preliminary investigations reported by the above mentioned companies have established studies to evaluate wellness programs' effectiveness.

William B. Baun, Director of the Tenneco Health and Fitness Program, studied the relationship of illness absenteeism rates by exercising and non-exercising participants employed by Tenneco after the program's first year of operation.

The study included 201 non-exercising and 221 exercising employees for the study. Each employee entered the program free of charge, on a voluntary basis and was required to undergo a pre-exercise screening process. The process included a health history, blood chemistry screen, medical exam, maximal graded exercise stress test and a fitness assessment program planning session.

Exercise activity was measured as the total number of computerized recorded exercise sessions during the study period. Illness absenteeism was quantified as the total number of recorded sick hours an employee used in 1981. "Sick hours" were also tabulated to compare the illness absenteeism prior to program initiation.

Data analysis included a t-test to determine if there were significant physical differences between exercising and non-exercising participants in addition to absenteeism patterns.

The results indicated a trend for exercisers to have fewer sick hours than the non-exercisers with a significant difference demonstrated between female exercisers and non-exercisers of 47 versus 69 hours. Females, both exercisers and non-exercisers, had significantly higher sickness absenteeism rates than males. In both the male and female exercise groups, there is a trend for sick hours to be inversely related to advancing age, whereas in the non-exercising groups the reverse is found. In comparing 1983 to 1981 sick hours, the relative absenteeism did not significantly change prior to and after the opening of the Tenneco Fitness Program (Baun, 1984).

In similar programs, Mesa Petroleum, a gas and exploration company, formalized an employee fitness program in 1979 by constructing an extensive exercise facility staffed with three fitness professionals. In 1981 the staff organized the company into six areas of program design, evaluation, exercise prescription, follow-up, health education, employee motivation and documentation, the purpose of which was to enhance productivity and health by providing guidance in the implementation of personal fitness programs.

Tangible productivity, the area under study, was defined by Mesa as having less absenteeism and more time on the job. Possible decreases in medical costs and increased physical activity on the part of each employee was also measured.

Again, as in the Baun-Tenneco study, exercising and non-exercising sample groups were used. The established criteria for exercise activity was based on the recommendations of the American College of Sports Medicine. The exercising study group was identified as participating in aerobic exercise at least three times per week for thirty to sixty minutes at 60 to 85 percent of their maximum heart rate range.

Absenteeism rates were documented from monthly time sheets. A non-paired t-test was utilized to statistically compare exercising and sedentary groups for absenteeism measurements. Data was collected from a total of 707 employees who were with the company in 1982 and 1983, the years which the study originated.

A cross-sectional analysis of the relationship between absenteeism and activity level concluded that during both years a relationship existed indicating that the higher the activity level the lower the absenteeism rate. The 265 sedentary employees averaged 41 hours of sick time, whereas the 442 active employees averaged only 20 hours. The difference was statistically significant.

In 1982, Mesa's absenteeism rate was 29 percent lower for exercising than non-exercising employees and in 1983 a 51 percent decrease was cited for employees who were active.

In researching the subgroup analysis, Mesa revealed an

opposite finding relating to sex (Baun, et al, 1982). At Mesa the male exercisers were significantly lower in absenteeism than non-exercising males. But there was no significant difference between female exercisers and non-exercisers. Overall Mesa's participation rate among the company's population was 58 percent in 1982 and 63 percent in 1983, slightly higher than the 43 percent reported by Baun.

In contrast to the Tenneco and Mesa Study, R.J. Shepard spearheaded an experimental plan in 1977 to 1978 to determine the influences of employee health programming upon fitness and absenteeism utilizing separate test sites and separate companies.

The head offices of two large Canadian Assurance Companies both located in Toronto agreed to participate. One company was used as a test group with over 1,282 employees voluntarily participating. While the other, a control company utilized 577 employees.

The health programming included a fitness test demonstration at the company cafeteria with employees subsequently invited by personal letter to participate in fitness testing. Physiological evaluations were made and a fitness program was initiated. Employees were assigned to age and sex specific classes and a personal fitness program based on three, 30 minute gymnasium sessions per week were developed for each. The emphasis of the classes

was upon a slow but progressive development of cardio-respiratory fitness. By the end of the six month experimental period, employees had progressed to 17 minutes of endurance training with significant improvements in cardiac efficiency, body weight, body fat and flexibility (Shepard, 1981).

Shepard categorized his participants into the following subgroups at the experimental test company.
1) Nonparticipants who undertook fitness testing but did not become involved in fitness classes; 2) Dropouts, dropping out of the employee fitness program, but remaining in research; 3) Low adherents in which attendance in fitness classes was sporadic and inconsistent; and 4) High adherents in which attendance occurred in two or more classes per week throughout the experimental time period; and 5) The control company.

Absenteeism was collected three months prior to the fitness testing dates and three months following. Figures were placed into categories of absences of less than three days duration, certified absences of three days or greater and the number of Mondays and Fridays absent.

Physiological changes such as gains in cardiac efficiency, flexibility, loss of body fat were seen in the group of subjects as a whole. The largest changes being for the high adherents in the program. Absenteeism of high adherents was reduced by 20% relative to other employees and

average monthly figures showed a decrease of 20% between control and test companies (Shepard, 1981).

Shepard noted that data between test and control might have been affected by seasonal factors such as flus and epidemics and that the most valid comparison was the behavior of the high adherents to all other subgroups.

Some of the weaknesses with such research was cited by Shepard. Relating that although interest due to exposure of the fitness program was undoubtedly increased at both companies, there is no way such a test could be introduced in a single or double blind fashion. What possibly was observed was a response to a change in company policy or concern rather than a direct relationship to the fitness program (Hawthorne effect). In conclusion, Shepard states that the stimulus to effect health changes is encouraging even if it ultimately proves to be non-specific to the employee fitness program.

The results of employee wellness programs on fitness and absenteeism are beginning to demonstrate reasonable evidence of program effect. However, much of the data collected is not statistically significant over the course of short range studies. The weaknesses of such studies as indicated earlier include human rights constraints, the inability to select a strong control or treatment group, seasonal factors and the question of the Hawthorne effect.

Despite the variability in testing methods and the

diluted evidence of cost savings, benefits seem large enough to warrant long range documentation and study. The potential could be considerable if methods of recruitment and compliance, documentation coupled with enhanced exercise selections, facilities and staff could be established. In the long run, the payoffs could be sizeable in terms of monies saved for the company due to absenteeism and the response of employees leading happier and healthier lifestyles (O'Donnell, 1984).

CHAPTER 3

Research Methodology

The purpose of this study was to evaluate for physical fitness and absenteeism comparisons between exercising and non-exercising employees who participated in a worksite wellness program.

The Sources of the Data

The sources of the data for this study included the testing of 222 employees of the Foster Farm Turkey Production Plant located in Turlock, California. Foster Farms initiated an employee wellness program in September of 1985 which included fitness testing, evaluation and exercise prescriptions, health education classes and exercise programs. This benefit was applicable to all levels of the employee population.

Fitness testing was completed on company time and was free of charge. All other aspects of the wellness program such as health education or exercise classes were conducted at the leisure of the employee. Confidentiality in respect to the fitness testing results was highly stressed. Only the employee, the attending exercise technician and the physician who reviewed each employees test results had access to such information.

Overall the study group consisted of 118 female and 104

male employees. Average age was 33.8 and 38.1 years respectively. The exercising study group included 106 employees, while the non-exercising study group had 110. The timeframe between pre-testing and post-testing was six to eight months and continued from September of 1985 to October of 1986.

Data Collecting Instruments

Several types of equipment and testing methods were utilized during the course of the fitness testing. The first phase of the fitness test included utilization of an interview survey to determine the employee's medical history and exercise background. Such questions included information of sex, height, job description, history of orthopedic, respiratory and physical limitations. Family history of coronary heart disease, smoking and drinking patterns, nutritional habits, exercise routines and psychological stress levels were also determined by the interview survey.

The second phase of the fitness test included determination of weight, blood pressure, resting pulse, flexibility, percent body fat and cardiovascular efficiency, each utilizing various testing methods and equipment.

The health and physical fitness tests were determined utilizing the following equipment:

1. Weight was determined with a SECA physician's scale.

2. Blood pressure was obtained with an adult size Marshal blood pressure cuff with an anarord manometer.

3. Resting pulse rate was monitored by utilizing the radial palpitation technique. Counting started from zero and continued for 15 seconds. The beats per minute were multiplied by four.

4. Flexibility was recorded using a sit and reach test.

5. Percent body fat was recorded by measuring specific skinfold sites with the Skyndex skinfold calipers.

6. Cardiovascular efficiency was determined utilizing the Kasch Step Test method.

Procedure for Data Collection

A total of 222 subjects were involved with the fitness testing and evaluation. The total employee population was aware of the Foster Farms Employee Wellness Progam due to in-house promotion of the program. Employees who were involved with the fitness testing signed up with the company benefits counselor and was scheduled for a prearranged appointment with the Dameron Hospital Wellness staff. At the time of the sign-up each employee was given an outline and description of the areas to be tested. This outline highlighted what to expect during the fitness test and the demands of the testing in terms of physical exertion. Employees were told to come to the test site wearing athletic shoes and comfortable sweats.

All fitness testing was completed in the following sequence: resting pulse, blood pressure, weight, flexibility, percent body fat and cardiovascular efficiency.

The testing methods followed in the appropriate sequence began with determination of a resting pulse. Resting heart rate is one of the easiest parameters to monitor and is probably one of the most widely used (Miller, 1979).

With the subject in a sitting position the exercise technician places the first and second fingers lightly over the radial pulse and counts the pulsations for 15 seconds, starting the counting from zero and multiplying by four to find the beats per minute.

Determination of blood pressure followed with utilization of an adult size marshall blood pressure cuff placed directly over the right arm with the cuff based over the top of the brachial artery. The cuff was pumped up to 200mmHg and slowly released to determine a systolic and diastolic reading.

Weight, using a physician's scale was placed on a carpeted surface at both pre and post test locations. The subject was asked to remove his/her shoes and step onto the scale. Weight readings were measured in pounds to the nearest one half pound.

The measurement of flexibility can only be specific to particular joints in the body. No single test can measure the flexibility for all the major joints. For the purpose of this study, trunk and hip flexibility was determined utilizing the sit and reach test (Miller, 1979). A measurement was taken at the point in which the fingers reached the box. If the employee did not reach the box a negative score of 10 was given. The best of two attempts was used.

Percent body fat measurements were tabulated using the Skyndex skinfold calipers. Three sites were tested on both male and female subjects. For the males, chest, abdominals and thighs were the sites measured to determine percent fat. The female sites included triceps, supraillium and thighs. A total of three readings were taken at each site and an average was determined based on those findings (Jackson, Pollock 1985). The results were based on sex and age and the total milimeters of skin pinched. Although some have suggested more stringent guidelines for general health on this testing procedure, Luhman (1984) considered that the level of fat content in men and women should range from 10% to 22% and 20% to 32% respectively.

Cardiovascular efficiency was tested utilizing the Kasch step test method. This test followed these procedures:

1. A 12-inch high step bench was used as the testing

instrument.

2. The stepping was done in a brisk four-step sequence. Up right, up left, down right, down left. Cadence was at 24 steps per minute.

3. The test required three minutes of consistent stepping. Each employee was asked to demonstrate the stepping sequence to assure appropriate pace on the box.

4. Upon completion of the task the subject was asked to sit down and the recovery pulse rate was thus monitored within fifteen seconds using a 15 second pulse rate count (Blood pressure was also monitored as a precaution). (EDEH Foundation, 1986). The determination of the post exercise heart rate reflects the cardiovascular system's ability to recover from exercise, and from this cardiovascular fitness is estimated. Utilizing a charting system the employee's cardiovascular fitness was established against norms for age and sex. There may be as much as 10 percent to 20 percent error in estimating cardiovascular fitness using the Kasch step test. The estimated maximum heart rate for any given age can vary by as much as 24 BPM. Also at any workload, oxygen uptake can vary by as much as 15 percent between subjects (Verity, 1987). However, despite the possibility of error, this test provides a reasonable measure of cardiovascular efficiency. For the purpose of rating the category of fitness for each employee who participated in the step test a score of one, two or three was given. A one

rating was for excellent cardiovascular efficiency, two for average-good and three for poor cardiovascular efficiency.

After completion of the pretest fitness evaluation, results of the subject's performance was given. In reviewing each evaluation, the subject was informed of his or her specific scores, in comparison to what was considered normal or above average and what was desired. Based on the results of the evaluation, an exercise prescription was designed to accommodate the physical limitations and age of the subject. Special emphasis was placed on improvement of cardiovascular efficiency, flexibility and weight control. The subjects were given a choice of aerobic activities from which to select. Such programs included walking, jogging, swimming, cycling, aerobic dance, rowing and stationary bicycling. To ensure establishment of an exercise program suitable for all ages and fitness levels, Dr. Ken Cooper's Total Fitness exercise outlines were used (Cooper, 1982).

The exercise prescription outlined a specific aerobic activity, program frequency, intensity, mileage or distance of activity and program duration. Each exercise prescription was selected to meet the physical limitations and needs of each subject.

The subject was then instructed on the personal monitoring of his or her pulse rate using the radial pulse. The age adjusted maximum heart rate and training rate were also determined for each subject. In addition to the

exercise prescription preliminary warm-up stretches and cool-down stretches were given to accompany the exercise program. Suggestions and recommendations on strengthening exercises and weight control were also given if the subject warranted attention in those areas.

Following the one hour fitness test the subject was instructed to attempt their personal exercise program in a safe and progressive manner and to consult with the Wellness Staff at any point within their program.

It was emphasized that a post-test would proceed within six to eight months after the initial pre-test. This was to determine if any physical changes had occurred within that time frame.

The post test phase included a replication of the pre-test fitness evaluation, in addition to a short interview survey to assess the employee about his/her exercise habits between the pre-test and post-test.

The interview survey included questions on the frequency of exercise, any dietary changes involving weight loss or weight gain and other lifestyle changes which may have occurred. It was from this survey that we determined which employees were categorized as the exercise or non-exercise groups.

In addition to the voluntary fitness testing and exercise prescription other wellness programs were being offered to the employees. Such wellness programs included

on-site aerobic classes, health education classes such as stress management, cardiovascular fitness, weight control, cholesterol and your heart and various recreational programs. However, these were completed on the employee's own time such as work breaks, lunch time, afternoon and weekends.

Analysis of the Data

The data was analyzed using a Student's paired t-test to compare the physical changes occurring within each sample group from pre-test to post-test. A one-tailed test was utilized to determine significance at the .05 level.

To determine the difference between each group a one-tailed t-test was again utilized. Based on a t-test for independent samples, significance was at the .05 level.

An independent Student's t-test was used to compare the average amount of sick hours between exercising and non-exercising employees, while analysis of variance was incorporated to determine level of significance within exercising and non-exercising groups.

CHAPTER 4

Results

Analysis of the data. The main problem of this study was to evaluate for comparisons of specific physical fitness parameters and absenteeism between exercising and non-exercising employees who participated in a work-site wellness program at the Foster Farms Turkey Production Plant. Specific fitness parameters tested included weight, percent body fat, cardiovascular efficiency, flexibility, resting pulse, systolic and diastolic blood pressure. A Student's t-test was chosen to provide a statistical evaluation of test scores for identification of potential differences.

In all statistical tests the level of significance was .05. This level was established for the purposes of identifying conformity within the data, and because we cannot rule out the matter of chance, a 5% margin for variance between the two test groups was selected (Leedy, 1981).

For the purposes of this study appropriate hypotheses stated in the null form were used for each subproblem addressed.

The first subproblem of this study evaluated specific physical fitness parameters comparing exercising and non-exercising employees at pre-test phase prior to any

intervention of exercise prescription or discussion of test results. Those fitness parameters measured included weight, percent body fat, flexibility, resting pulse, cardiovascular efficiency and blood pressure, both systolic and diastolic. Statistical values of test results are presented in Table I.

Of the six parameters measured only one, resting pulse yielded a statistically significant difference at pre-test time ($p<.05$). The mean score for resting pulse for exercisers was 75.2 BPM, while non-exercisers had a mean score of 79.1 BPM, this presented a mean difference of 3.98 BPM.

In Subproblem II the six physical fitness parameters tested within the exercising group at pre-test phase were compared with post-test results. All parameters cited in Table II charted a statistically significant improvement.

The test results indicate that the fitness parameters showing an improvement include weight (-1 lb), percent body fat (-1.5%), flexibility (+5 in.), cardiovascular efficiency and systolic blood pressure, (systolic -3.5 mmHg). There was no significant difference in resting pulse and diastolic blood pressure.

Physical fitness parameters for the non-exercising study group at post-test phase were compared with pre-test values in Subproblem III. Table III summarizes the calculated values.

Those fitness parameters in which a statistically

TABLE I

Physical Fitness Differences Between Exercising and Non-exercising Employees at Pretest Phase

Parameter Tested	Exerciser		Non-Exerciser		Mean Difference	One-Tailed Probability*
	$\bar{X}$	STD	$\bar{X}$	STD		
Weight	159	36.6	162	34.2	3.0 Lbs	0.495
% Body Fat	20.6	6.9	19.7	7.6	0.9 %	0.331
Resting Pulse	75.2	9.3	79.1	10.0	3.9 BPM	0.002*
Flexibility	14.7	3.3	14.1	4.0	.6 IN	0.216
Cardiovascular Efficiency	2.3	0.6	2.4	0.6	.1	0.447
Systolic Blood Pressure	116.5	14.3	116.5	16.1	0 OmmHg	0.998
Diastolic Blood Pressure	79.3	10.7	80.1	11.4	.08 mmHg	0.570

* Indicates significance at .05 Level

TABLE II

Physical Fitness Changes from Pre-test to Post-test Phase for Exercising Employees

Parameter Tested	Pre-Test		Post-Test		Mean Difference	One-Tailed Probability*
	$\bar{X}$	STD	$\bar{X}$	STD		
Weight	158	33	157	34	-1 Lbs	.038
% Body Fat	20.9	6.9	19.4	6.7	-1.5 %	.0001*
Resting Pulse	75	9.5	74	9.3	-1.0 BPM	.780
Flexibility	14.7	2.9	15.2	3.2	+-.50 IN	.001*
Cardiovascular Efficiency	2.4	0.6	2.1	6.5	+0.3	.0001*
Systolic Blood Pressure	116.5	14.6	113.0	13.6	-3.5 mmHg	.005*
Diastolic Blood Pressure	79.9	10.6	78.3	10.0	-1.6 mmHg	.058

*Indicates level of significance at .05 level.

TABLE III

Physical Fitness Changes from Pretest to Post-test Phase for Non-Exercising Employees

Parameter Tested	Pre-Test		Post-Test		Mean Difference	One-Tailed Probability*
	$\bar{X}$	STD	$\bar{X}$	STD		
Weight	162	34	162	34	0 Lbs	.46
% Body Fat	19.8	7.7	19.1	7.9	-.70%	.006*
Resting Pulse	79.1	10.0	75.0	11.5	-4.1 BPM	.005*
Flexibility	14.1	3.8	14.3	3.6	-2.0 IN	.134
Cardiovascular Efficiency	2.4	0.6	2.3	0.5	.10	.025*
Systolic Blood Pressure	116.9	16.3	113.9	13.3	-3.0 mmHg	.013*
Diastolic Blood Pressure	79.9	11.5	78.4	11.2	-1.5 mmHg	.050*

*Indicates level of significance at .05

significant improvement was observed included percent body fat (-7%), resting pulse (-4.1 BPM), cardiovascular efficiency and blood pressure, (systolic -3.0 mm.Hg and diastolic -1.5 mm.Hg). No significance was shown for flexibility and weight for the non-exercisers.

In Subproblem IV physical fitness parameters between exercising and non-exercising study groups were compared. Table IV summarizes those changes which occurred within the fitness parameters measured.

The analysis of the data identified a statistically significant degree of improvement in percent body fat (-1.40%) for the exercising study group when compared to non-exercisers. Non-exercisers when compared against exercisers produced a change in resting pulse (-7.98 BPM) which was statistically different at the .05 level.

Absenteeism sick hours as recorded for exercisers and non-exercisers alike were examined in sub-problem V. Table V lists the sick hours reported by each group. It was revealed that the exercising employees averaged 20.0 hours per year of sick time while non-exercisers averaged 25.5. The mean difference was 5.5 hours between the two groups. The comparison was not statistically significant. However when observing for a change within the groups it was noted that exercisers cited a statistical difference between excellent, average-good and poor cardiovascular performers. Non-exercisers noted no significance within their group.

TABLE IV

Comparison of Change Between Exercising and Non-exercising Employees at Post-Test Phase

Parameter Tested	Exerciser		Non-Exerciser		Mean Difference	One-Tailed Probability*
	$\bar{X}$	STD	$\bar{X}$	STD		
Weight	1.19	7.11	0.05	6.25	-1.14 Lbs	.100
Weight	1.19	7.11	0.05	6.25	-1.14 Lbs	.100
% Body Fat	1.47	3.08	0.70	2.90	-1.40%	.028*
Resting Pulse	1.32	9.20	4.16	12.7	2.84 BPM	.033*
Flexibility	-0.50	1.75	-2.25	2.40	-2.0 IN	.187
Systolic Blood Pressure	3.54	14.4	2.95	13.7	-0.59 mmHg	.377
Diastolic Blood Pressure	1.58	10.6	1.52	9.71	.483 mmHg	.060

*Indicates significance at .05 level

TABLE V

Average Sick Hours within Exercising and Non-Exercising Groups—Based on Cardiovascular Efficiency Ratings

Exercise Cardiovascular Efficiency	$\bar{X}$	STD	Level of Significance* Within Groups
1-Excellent	13.3	29.9	.0007*
2-Average/Good	12.5	24.9	
3-Poor	42.0	52.7	
Average	20.0	36.0	

Non-Exercising Cardiovascular Efficiency	$\bar{X}$	STD	Level of Significance* Within Groups
1-Excellent	4.0	6.6	.3877
2-Average/Good	25.4	33.8	
3-Poor	28.7	50.1	
Average	25.5	40.2	

* Indicates significance at .05 level.

Comparison of exercisers and non-exercisers on absenteeism averages not statistically significant ($p>.2033$).

CHAPTER 5

Discussion

Health and physical fitness parameters were assessed in exercising and non-exercising participants drawn from the larger population of the Foster Farms Employee Wellness Program. Based on the findings of this study each sample group showed statistically significant changes at post-test phase in at least some, but not the same, parameters tested.

As characterized in Tables II and III, each study group at post-test time produced significant changes in physical fitness. For the exercising group, weight, percent body fat, flexibility, cardiovascular efficiency and blood pressure parameters witnessed positive alterations during the study period of six to eight months. Within the non-exercising group, percent body fat, cardiovascular efficiency, resting pulse and blood pressure improved. In a similar situation, Shepard (1981) measured small gains in physical fitness at both test and control companies. To conclude that a specific catalyst, such as exercise is responsible for altering the physical fitness changes of each group would be assuming too much. The variations which produced these changes could be attributed to enhanced self-motivation to create a healthier lifestyle, a greater awareness of individual fitness limitations due to the intervention of the fitness evaluation and exercise prescription and the in-house

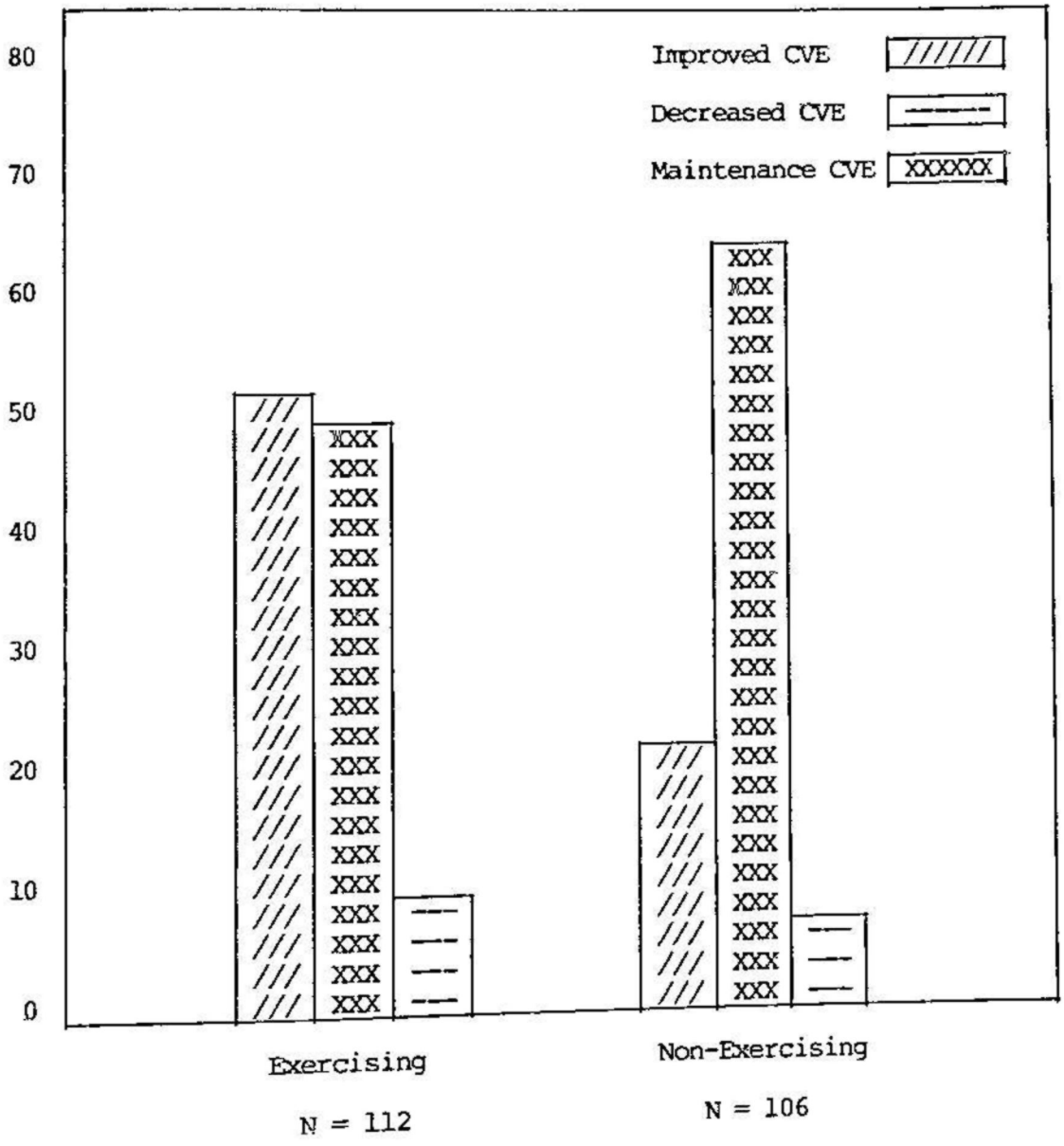
promotion of wellness concepts. The support of other committed employees to the goal of exercise maintenance coupled with personal goals could also have influenced test results.

Because sampling of participants for the exercise and non-exercising groups was selected from within the Foster Farms Employee Wellness Program, it was impossible to isolate strict control and treatment groups. Therefore, monitoring of physical activity and involvement within other fitness related programs was impossible to enforce. This lack of monitoring capabilities could possibly have given way to increased interest by both study groups to be exposed to a variety of exercise and health education programs. This could have affected individual health and fitness attitudes over a broad base resulting in a positive change observed by exercising and non-exercising employees alike.

Although not listed as a sub-problem, identification of the degree of improvement in cardiovascular efficiency between groups is important to note as it lends to the value of this study. As shown in Graph I, the statistical process of the Z-test reveals the differences in cardiovascular efficiency between exercising and non-exercising employees at post-test phase. This statistical study determined if employees improved, decreased or maintained cardiovascular efficiency throughout the six to eight month pre-test to post-test time period. It was noted that within the exercising study group, 53 employees improved, 52

GRAPH I

Improvement in Cardiovascular Efficiency Between Exercising and Non-Exercising Employees



maintained, and 7 employees decreased their cardiovascular performance. The non-exercisers showed 18 employees who improved, 80 who maintained, and 8 who decreased. The degree of improvement in comparing the two groups was statistically significant at the .05 level. However, in comparing the degree of individual improvement in cardiovascular efficiency ratings, specifically between those employees who were classified as poor performers and those who were classified as average-good, no significant differences were observed between the two groups.

For evaluation purposes it is evident that the introduction of a systematic aerobic exercise program or the continuance of a fitness program already in existence contributed to the statistical difference between exercisers and non-exercisers within the fitness parameter of cardiovascular efficiency.

Because of the complexity of the problems, solutions and conclusions regarding the relationships between exercise, lifestyle and absenteeism are difficult to define specifically. In addition to the variables of self-motivation, individual behavior or increased awareness, seasonal factors should also be included.

Although not conclusive, at the time of testing a relationship seemed to exist between physical performance and the time of the year. The seasonal factors perhaps could have contributed to the improvement, maintenance or

decreases in cardiovascular performance.

During testing within the summer and spring months, a time of year in which physical activity is more spontaneous and employees are oriented to a greater attendance recreationally, employees' performance was enhanced and scores were better. Within the fall and winter months, a time in which activity naturally decreases due to cold weather conditions and an overall decrease of recreational activity is apparent, performance seemed to decrease. Differences among employees culturally, environmental influences (work and job description), motivation of employees, and reaching individual employees who have difficult problems must also be noted. In addition, age, personal physique, and psychological differences can affect the ways employees fit into an exercise program. (Danielson, 1982)

Absenteeism is a major expense associated with poor fitness. As many as 132 million lost work days per year are attributed to heart attacks in the U.S. (Kayla, 1975). In tabulating the yearly "sick hours" for exercising and non-exercising employees (Table 5), the exercising study group averaged 20.0 (<.007) hours of sick time per year, while non-exercising cited 25.5 per year for sick time. This was statistically significant for the exercising study group. However, it was not statistically significant when each group's sick hours were compared. This observation is

similar to Shepard's study in which subjects who were high in adherence within an exercise program showed a 22 percent reduction in absenteeism concluding that a favorable reaction to exercise adherence can alter employee work absence attributed to illness.

The mechanisms influencing reported employee sick time are very complex. (Gordell, 1971; Steers and Rhodes, 1978). An increase in cardiorespiratory fitness could influence fatigue and the ability to work through a minor illness (Shepard, 1977), and an elevation in mood could also influence reactions to minor infection, thus altering yearly sick time. A link between wellness programs and absenteeism could also have been influenced by employee motivation.

The potential gains are large enough to merit further investigation on a long-term basis. Only an extended investigation (a three- to five-year sampling) could provide convincing proof of the long-term effect upon absenteeism.

Recommendations

Based upon the findings from this study, the researcher makes the following recommendations:

1. A study such as this which measures physical fitness changes associated with a systematic exercise program be introduced as a long-term project. Larger sample groups with better control and treatment over a longer test period could have introduced more conclusive and detailed information and data.

2. The observance of illness absenteeism among employees should be closely charted in order to identify specific types of illnesses such as length and type of sick leave, days of absence and work relatedness. This would derive stronger data in regards to how illness absenteeism is being spent by employees and consequently strengthen future data needed to prove that health promotion and fitness programming can be effective tools in altering poor employee health in a positive direction.

3. Repeat a study such as this utilizing these test results as baseline data for comparison to results found in the same study three to five years from now. This would invite stronger conclusions as to how a worksite wellness program might influence employee health.

Conclusions

1. In measuring for potential changes within the fitness parameters measured, both study groups at post-test phase exhibited statistically significant changes. Within the exercising and non-exercising group five parameters were positively affected. However, when compared against each other, only selective parameters were affected. Therefore, based on the physical fitness changes which occurred between the two study groups, it is concluded that variables, other than exercise had an effect on the health and physical fitness parameters measured. The introduction of health education combined with exercise, together had a

favorable effect on the total employee population involved with this study.

2. Absenteeism, as cited within this study was found to be 5.5 hours less for the exercising group, but was not statistically significant. When viewing comparisons within groups, however, a statistical significance was found within the exercising study group. This observance provides early evidence that exercise activity and fitness can influence the direction of illness absenteeism in a beneficial manner, but only long-range data will dictate if absenteeism can be altered for the total employee population. The initial data is strong enough to warrant future studies.

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