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THE RELATIONSHIP BETWEEN SELECTED PROGRAM COMPONENT
COMBINATIONS AND ADHERENCE IN A TWELVE WEEK
EMPLOYEE FITNESS PILOT PROGRAM

by

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ABSTRACT

The purpose of this study was to determine which of several selected combinations of components within an employee fitness program would positively effect female hospital workers' rate of adherence to a regular physical activity routine. Additional problems included: (i) studying the effects of the twelve week employee fitness pilot program on the measured dependent variables performed on the employee sample and (ii) determining a relationship between adherence rates (high or low) and the amount of change in the hypothesized improvements.

Fifty physically inactive female employees from Peace Arch District Hospital in White Rock, B.C. volunteered to take part in the employee fitness program. The subjects were randomly assigned to one of three groups. Each group participated in a lifestyle and fitness assessment but was otherwise distinguished as follows: Group 1 was assigned to the exercise facility, exercise classes and the education and motivation program; Group 2 was assigned to the exercise facility and exercise classes, and Group 3 was assigned to the education and motivation program. An attempt was made to determine if the maximal stimulus program available to Group 1 resulted in (i) a superior rate of adherence to a regular exercise routine and (ii) a greater improvement in the dependent variables, compared with Groups 2 and 3.

The Employee Fitness Program was conducted over a twelve week period and the subjects were pre and post tested for physical activity levels, physical fitness (as indicated by predicted oxygen uptake, flexibility and percent body fat), lifestyle risk factors and self concept which were then analyzed by separate ANOVA's. Instruments used were: the Action B.C. Nutrition Evaluation to determine physical activity levels, the Dynavit computerized bicycle ergometer, the Action B.C. norms for flexibility, the Kuntzelman method for determining percent body fat, the Health Hazard Appraisal and the Tennessee Self Concept Scale. Adherence data was collected on self reported progress charts and analyzed by the use of the Chi-square test of independence.

The results indicated a significant improvement in the physical activity and physical fitness of the employee sample. There were no significant improvements in the lifestyle risk factors and self concept over the course of the study. As well, no significant differences were noted among the three groups in adherence and in the improvements in the dependent variables. Only three variables - predicted oxygen uptake, back extension and percent body fat - were considered appropriate for statistical analyses regarding high vs. low adherence due to the unequal number of subjects in the two groups and the large differences among cell variances. In these three variables, the high adherence participants showed a significant improvement over the low adherence participants. This trend was also noted in the other five variables inappropriate for statistical analyses.

TABLE OF CONTENTS

CHAPTER		PAGE
1	INTRODUCTION TO THE PROBLEM.....	1
	STATEMENT OF THE PROBLEM.....	3
	DEFINITIONS.....	6
	DELIMITATIONS.....	8
	ASSUMPTIONS AND LIMITATIONS.....	8
	HYPOTHESES.....	4
	SIGNIFICANCE OF THE STUDY.....	9
2	REVIEW OF LITERATURE.....	10
	FACTORS INFLUENCING EXERCISE PROGRAM ADHERENCE.....	16
	STRATEGIES FOR INCREASING ADHERENCE.....	24
	COMPONENTS OF AN EMPLOYEE FITNESS PROGRAM.....	30
	SUMMARY.....	32
3	METHODS AND PROCEDURES.....	33
	Subjects.....	33
	Time and Duration of the Study.....	33
	Personnel.....	34
	PRE-PROGRAM PROCEDURES.....	34
	LIFESTYLE AND FITNESS ASSESSMENT.....	36
	TESTS.....	38
	The Dynavit Test for Cardiovascular Fitness.....	38

TABLE OF CONTENTS

CHAPTER		PAGE
	Tennessee Self Concept Scale.....	40
	The Health Hazard Appraisal.....	42
	Action B.C. Nutrition Evaluation.....	44
	EMPLOYEE FITNESS PROGRAM.....	45
	EXPERIMENTAL DESIGN.....	46
	DATA ANALYSIS.....	47
4	RESULTS AND DISCUSSION.....	48
	RESULTS OF THE EMPLOYEE FITNESS PILOT PROGRAM.....	50
	RESULTS: THE SELECTED PROGRAM COMPONENTS AND ADHERENCE.....	56
	RESULTS: HIGH VS. LOW ADHERENCE PARTICIPANTS.....	59
	DISCUSSION OF THE EMPLOYEE FITNESS PILOT PROGRAM RESULTS.....	67
	DISCUSSION OF THE PROGRAM COMPONENTS AND ADHERENCE RESULTS.....	69
	DISCUSSION OF HIGH VS. LOW ADHERENCE RESULTS.....	73
5	SUMMARY AND CONCLUSIONS.....	75
	SUMMARY.....	75
	RESULTS.....	78
	CONCLUSIONS.....	80
	RECOMMENDATIONS.....	81

TABLE OF CONTENTS

CHAPTER	PAGE
REFERENCES.....	83
APPENDICES.....	89
APPENDIX 1: P.A.D.H. EMPLOYEE FITNESS PROGRAM PROPOSAL....	90
APPENDIX 2: LIFESTYLE AND FITNESS ASSESSMENT MATERIALS....	99
APPENDIX 3: EMPLOYEE FITNESS PROGRAM SCHEDULE AND FITNESS LEADERS SCHEDULE.....	104
APPENDIX 4: LIFESTYLE EDUCATION AND MOTIVATION PROGRAM....	1077
APPENDIX 5: BIBLIOGRAPHY OF HEALTH EDUCATION LITERATURE AND "FITNESS MEMOS".....	112
APPENDIX 6: INDIVIDUAL RAW SCORES.....	122
APPENDIX 7: ANOVA TABLES FOR DEPENDENT VARIABLES (GROUPS 1, 2 AND 3).....	127
APPENDIX 8: ANOVA TABLES FOR DEPENDENT VARIABLES (HIGH AND LOW ADHERENCE GROUPS).....	130

LIST OF TABLES

TABLE		PAGE
1.	Subject Data.....	49
2.	Observed Cell Means for Groups 1, 2 and 3.....	50
3.	Marginal Means and F Values.....	51
4.	Chi-Square Test of Independence (Crosstabulation of Groups by Adherence).....	57
5.	ANOVA Table for Sit and Reach.....	58
6.	Observed Cell Means for High vs. Low Adherence Participants.....	66
7.	Health Hazard Appraisal (Pretest Mean Ages).....	68

LIST OF FIGURES

FIGURE		PAGE
1.	Predicted Oxygen Uptake (3 Groups).....	52
2.	Sit and Reach (3 Groups).....	52
3.	Shoulder Extension (3 Groups).....	53
4.	Back Extension (3 Groups).....	53
5.	% Body Fat (3 Groups).....	54
6.	"Appraised" Age (3 Groups).....	54
7.	Caloric Expenditure (3 Groups).....	55
8.	Tennessee Self Concept Score (3 Groups).....	55
9.	Sit and Reach.....	60
10.	Predicted Oxygen Uptake (High vs. Low Adherence).....	62
11.	Sit and Reach (High vs. Low Adherence).....	62
12.	Shoulder Extension (High vs. Low Adherence).....	63
13.	Back Extension (High vs. Low Adherence).....	63
14.	% Body Fat (High vs. Low Adherence).....	64
15.	"Appraised" Age (High vs. Low Adherence).....	64
16.	Caloric Expenditure (High vs. Low Adherence).....	65
17.	Tennessee Self Concept Score (High vs. Low Adherence).....	65

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Chapter 1

INTRODUCTION

In recent years much interest has been directed to the formation of employee fitness programs in business and industry by both the private and public sectors in Canada and the United States. This interest reflects a growing awareness of and concern for the health hazards associated with modern sedentary living, where the cost of physical inactivity has resulted in the increase of "hypokinetic disease". This term includes the conditions of obesity, coronary heart disease, hypertension, bone, muscle and joint problems, premature aging and various vaso-regulatory disturbances (Kraus, Raab, 1961). Hypokinetic-related diseases constitute approximately 40% of all Canadian illnesses (Kavanagh, 1974).

Thirty-eight percent of all deaths in Canada can be attributed to heart disease (Taunton, 1978). This figure represents thousands of lost working years to Canadian employers. The cost to Canadian employers for compensation showed a national increase of 72% in the ten year period between 1965 and 1974. During the same period, wages increased 59% (Megalli, 1978). The estimated economic drain of cardiovascular disease on Canadian National Resources is 1.7 billion dollars annually. Loss of productivity, wages and disability insurance constitute 90% of this figure (Shephard, 1969).

Less prevalent than heart disease, the common backache costs Canadian industry millions of dollars each year in worker's compensation claims.

Provincial health care costs are rising yearly. The Ontario Health Insurance Plan (OHIP) raised its' spending from \$1.23 billion in 1970-71 to \$3.8 billion in 1977-78.

An Ontario provincial study titled "The Relationship between Physical Fitness and the Cost of Health Care" (Collis, 1977) concluded:

1. People with higher levels of physical fitness tend to have lower OHIP medical claims.
2. An estimated reduction of \$31 million in OHIP medical claims could be expected if all adults age 20-69 years of age were of at least average level of physical fitness.
3. People with higher levels of physical fitness tend to have reduced incidence of coronary heart disease.

A number of researchers has reported both physiological and psychosocial benefits of an employee fitness program (Cox, 1978; Peepre, 1978; Fogle, 1975; Koerner, 1973; Roth, 1978; Garson, 1977; Yarovote, 1974; Yuhasz, 1977, 1978; Heinzelman, 1974; Durbeck, 1972). A premise that the fit employee is absent less frequently and is more productive has been supported by several European studies (Raab and Gilman, 1964; Keelor, 1976; Pravosudov, 1976) and a Canadian project (Peepre, 1978).

Haskell (1978) has proposed that: "Sufficient data currently exist in support of health benefits resulting from a physically active life-style to justify including exercise as an integral component of health promotion programs in industrial settings".

Although hundreds of employee fitness programs do exist in Canada and the United States, long term adherence to supervised or unsupervised exercise has been a major problem for many of these programs. A strong, positive and consistent association exists between the beneficial results of exercise and adherence to an exercise program. Adherence rates are especially important for employee fitness programs when accumulating cost-effectiveness data for presentation to management.

A number of factors which influence the initiation of and adherence to exercise programs by adults has been reported. Much of the data available on factors important for adherence to exercise programs have been obtained from asking participants or drop-outs about program characteristics that influence their participation and not from controlled trials where selected program characteristics are systematically varied and their effects evaluated (Haskell, 1978).

STATEMENT OF THE PROBLEM

The purpose of this study was to determine which of several selected combinations of components within an employee fitness program would positively effect female hospital workers rate of adherence to

a regular physical activity routine. Based on a review of literature of past research the specific program components studied were:

1. a lifestyle and fitness assessment and retest (Groups 1, 2 and 3)
2. an on-site exercise facility with scheduled exercise classes (Groups 1 and 2)
3. an education and motivation program (Groups 1 and 3).

Sub-Problem

A sub-problem of this investigation was to determine if changes in functional physical fitness, self concept and lifestyle were related to the adherence rate of the employees.

HYPOTHESES

Employee fitness programs in Canada and the United States range from educational campaigns to on-site facilities and exercise opportunities. Regardless of the nature of the program, adherence to supervised or unsupervised exercise has been a major problem for many employee fitness programs. The question arises as to what is necessary to elicit long term participation by a significant number of the employee group?

Based on a review of the literature, three selected program components were included in the employee fitness program. Employees were assigned to various combinations of the program components in order to study the relationship between the components and adherence. Although each of the components can be considered a program in itself and could result in the initiation of and adherence to a regular exercise routine by the participants, the investigator felt that a combination of all three components was necessary to effect a high rate of adherence to a regular exercise routine by the employee group.

Hypothesis I

As a group, the participants in the employee fitness program will significantly:

- a) increase their daily physical activity as indicated by their reported caloric expenditure on the nutrition analysis.
- b) increase their physical fitness as indicated by changes in their predicted maximal oxygen uptake, flexibility and percentage body fat.
- c) increase their self concept as indicated by increases in their raw scores on the Tennessee Self Concept Scale.
- d) decrease their lifestyle risk factors as indicated by decreases in the "appraised" age on the Health Hazard Appraisal.

Hypothesis II

The employees who are involved in all three components of the employee fitness program (Group 1) will demonstrate:

- a) a higher rate of adherence to a regular exercise routine when compared to employees involved in only two components of the program (Groups 2 and 3).
- b) a significantly greater change in the measured dependent variables when compared to Groups 2 and 3.

Hypothesis III

High adherence participants in all three groups will show a significantly greater change in the measured dependent variables when compared to low adherence participants in all three groups.

DEFINITIONS

Employee Fitness Program - the term used to describe the physical activities, fitness assessments, exercise opportunities and educational sessions which were provided within the hospital to satisfy the needs and desires of the employees.

Lifestyle and Fitness Assessment - a program offered by Action B.C., which includes standardized physical fitness tests, nutrition evaluation and a Health Hazard Appraisal. Personalized pre-prescriptive exercise suggestions and lifestyle modifications schemes are included.

Action B.C. - a private, non-profit organization registered under the Societies Act of the province of British Columbia. Action B.C.'s objectives are to create and promote opportunities for lifestyle change through increased physical activity, sound nutrition and positive living habits. Action B.C.'s Health Promotion Program for Business and Industry has provided testing, counselling and consulting services for a number of organizations throughout the province. The investigator is employed by Action B.C. as an employee fitness consultant.

Health Hazard Appraisal - a tool used to assess one's potential health problems. The H.H.A. allows computation of an individual's "physiological" or "appraised" age based on lifestyle risk factors derived from a short and simple questionnaire.

Adherence - in this study, high adherence participants are those employees who are physically active three times a week or more according to the activity-need standards published by the American College of Sports Medicine (1978). Low adherence participants are those employees who are physically active less than three times a week.

Maximal Stimulus Program - the program available to Group 1 participants which included all three employee fitness program components.

DELIMITATIONS

1. The subjects for this study were full-time female employees in a general hospital, ranging in age from 20-59 years.
2. The length of the Employee Fitness Program was twelve weeks.
3. The Health Hazard Appraisal was used to assess the lifestyle risk factors of the employees.
4. The nutrition evaluation was used to measure the activity levels of the employees based on an averaged caloric expenditure for a three day period.

ASSUMPTIONS AND LIMITATIONS

1. It is assumed that the Health Hazard Appraisal is a reliable tool for the assessment of one's "appraised age" based on lifestyle risk factors.
2. It is assumed that the Dynavit bicycle ergometer is a valid and reliable measure of cardiovascular fitness.
3. It is assumed that the activity levels reported on the nutrition evaluation yield a reliable measure of caloric expenditure.
4. It is assumed that the Tennessee Self Concept Scale is a valid and reliable measure of self concept.
5. The study was limited by the number of employees who volunteered for the Employee Fitness Program.

6. It is assumed that the employees kept accurate attendance records on their monthly exercise progress cards.

SIGNIFICANCE OF THE STUDY

The information from this study should prove valuable to those organizations which wish to improve the adherence rate of employees to a company-sponsored fitness program. As employee fitness programs range from educational campaigns to on-site facilities with full time directors, this study may demonstrate basic program components necessary to effect a positive adherence rate to exercise. To the knowledge of this investigator, very little research has been done to show a cumulative effect of an educational program with the availability of a fitness facility and exercise opportunities on the adherence rate of an employee fitness program.

In addition, no other study has dealt with the implementation of an employee fitness program in a general hospital setting. As various programs do vary in scope and expense, those organizations with similar philosophy, finances, facilities and occupational settings may draw from the following information to effectively implement new programs or to enhance existing programs.

Chapter 2

REVIEW OF LITERATURE

A number of studies on employee fitness programs has reported a positive and consistent relationship between program effects and program adherence.

Heinzelman and Durbeck (1970) conducted one of the first major studies on the effects of physical fitness programs using employees of the National Aeronautics and Space Administration Headquarters in Washington, D.C. The program participants were expected to exercise for thirty minutes, three times a week, at an exercise facility located at the workplace. After one year, the subjects were asked to fill out a questionnaire with respect to perceived changes in attitudes, health and behaviour. In addition to the measured physiological improvement by participants, significant effects were reported on health attitudes and behaviour. In general, the program resulted in feelings of better health and stamina. Other effects reported included weight loss, decreased food consumption, more positive work attitude, less stress and tension, improved work performance, increased outside physical activity, more adequate sleep and rest and reduction in smoking. The subjective responses concerning the perceived changes in these areas corresponded very well with the measured levels of cardiovascular functioning. In general a highly consistent and positive relationship was observed between the subjective and objective

measures of program effects. Reported program effects were positively correlated with program adherence. Those who consistently participated in the program reported greater effects than those with poor adherence.

Yarvote et al. (1974) looked at cholesterol and triglyceride levels in relation to the degree of attendance of the participants in an Exxon Corporation employee fitness program. The program was established to provide a highly organized physical and cardiovascular conditioning system that combined scientific objectives, procedures and equipment. The program made exercise accessible to the participants through a concentrated schedule of activities and was closely supervised by the Medical Department Staff. The employees were encouraged to participate in the program at least three times a week. At the end of one year, the results indicated that those who attended two or more times per week on the average, had a decrease in serum cholesterol. The relationship between frequency of attendance and the level of triglyceride decrease was even more apparent. The mean change in triglycerides was directly related to the participant's attendance with maximum improvement seen in the group that attended, on the average, three exercise sessions per week. They concluded that a minimum average attendance of two times per week was necessary to produce the desired physiological improvement that occurred in the participants.

Fogle and Verdesca (1975) in a cardiovascular fitness program for employees at the Western Electric Company, divided the participants

into three groups: Group 1, those persons attending more than two sessions per week; Group 2, those persons attending more than one but fewer than two sessions per week; and Group 3, those attending fewer than one session per week. Physiological baseline data was collected and retesting took place approximately seven months after the program was initiated. The participants, executives ranging in age from 30-57 were permitted to exercise up to three times per week on company time and were encouraged to do so by the company medical staff. Their results showed that the ten subjects in Group 1 significantly improved their level of cardiovascular fitness. Mean heart rates were lower at rest, at all levels of exercise, and at recovery on the criterion stress test. Weight loss was significant and may have had an effect on the significant mean (26.5%) increase in predicted maximal oxygen uptake. Group 2 displayed a significant increase in maximal oxygen uptake, although less than the improvement in Group 1. Results for Group 3 were insignificant throughout, displaying no trends in the parameters examined. The researchers concluded that extensive improvement in cardiovascular fitness can be attained by active participation in a supervised exercise program, i.e. two to three times per week.

In a 10 week pilot employee fitness program established by Yuhasz (1977) for Alcan Smelters and Chemicals Ltd., significant improvements in physical fitness were demonstrated by those participants who attended a minimum of twice a week. Fitness measurements included a cardiovascular endurance test (PWC 170), body fat, body

weight, flexibility and grip strength.

In a similar project for 3M Canada Ltd., the average attendance for the pilot employee group was 2.2 times a week. The test-retest data indicated improvements in cardiovascular condition of 34% for men and 51% for women. Both sexes showed significant losses in body fat and body weight as well as significant improvements in back extension and forward hip flexion. Waist and calf girths decreased by 6% and 7% respectively. Participants reported improved attitudes and confidence. The ten week program was conducted three days per week after work. Each exercise session emphasized jogging, flexibility, muscular endurance and strength (Yuhasz, 1978).

Koerner (1973) ascertained the cardiovascular benefits derived from an employee fitness program conducted by the Xerox Corporation. Two groups of male executives were subjected to stress testing on a treadmill and their performances were compared. The program group was composed of men who had been in the fitness program for approximately 27 months. This group was subdivided into three categories based upon the frequency of participation. Participation in the program three or more times a week resulted in a "trained" classification; two but less than three times was classified "partially trained"; at least once but less than twice were classified "untrained". The pre-program group consisted of men who were tested as part of their screening examination prior to acceptance in the fitness program. All of this group were considered "untrained" based on their lack of regular exercise.

The program group was compared with the preprogram group by the duration of time the subjects performed within the limits of the test. The results indicated that the program group was able to perform an average of 19% longer than the preprogram group. All three categories of the program group surpassed the performance of the preprogram group. The "trained" individuals within the program group exercised the longest. The investigator concluded that the program groups appeared to have developed a greater aerobic capacity as well as better inotropic and chronotropic mechanisms for adaptation to greater work loads.

A six month Employee Fitness and Lifestyle Project (Peepre, 1979) conducted at the Canada Life Assurance Company in Toronto showed significant positive results in several measures of physical fitness, including cardiorespiratory fitness, reduction in percent body fat and an increase in flexibility. Stratification by fitness program participation showed that the changes in physical fitness were greatest in the "high-adherence" employees. "High adherers" were those that attended two or more classes per week, with "low adherers" attending less than two classes per week.

The high adherence participants showed a reduction in absenteeism relative to both the control group and to the low adherence participants. When total days absent were averaged for pre and post intervention, the "high adherers" had a 22% decline in absenteeism during the research period, beyond the seasonal trends for the rest of the experimental and control employees. Male participants showed the most improvement, by a 60% decline, while females showed a 38% decline overall and a 22%

decline on Monday and Friday absences. According to the researchers, this decline in absenteeism represents approximately 6,000 less days absent annually, or \$300,000 direct salary savings in a company of 1400 employees.

The high adherence group also demonstrated gains on a number of attitudinal questionnaires, particularly those concerned with the relationship of sport and physical activity to health. Females in this group also demonstrated a higher degree of satisfaction with their work environment.

The American College of Sports Medicine Position Statement on The Recommended Quantity and Quality of Exercise for Developing and Maintaining Fitness in Healthy Adults (July, 1978) has concluded that endurance training less than two days per week, less than 50% of maximum oxygen uptake and less than 10 minutes per day is inadequate for developing and maintaining fitness for healthy adults. The recommendations for the quantity and quality of training for developing and maintaining cardiorespiratory fitness and body composition in the healthy adult are:

1. Frequency of training: 3 to 5 days per week.
2. Intensity of training: 60% to 90% of maximum heart rate reserve or, 50% to 85% of maximum oxygen uptake.
3. Duration of training: 15 to 60 minutes of continuous aerobic activity.
4. Mode of activity: Any activity that uses large muscle groups, that can be maintained continuously, and is rhythmical and aerobic in nature.

FACTORS INFLUENCING EXERCISE PROGRAM ADHERENCE

Researchers have identified a number of factors which influences the initiation and the maintenance of exercise programs by adults.

Heizelman and Bagley (1970) have examined social and psychological factors that influence the effectiveness of programs in terms of how they are organized and administered. The following factors can influence the decision which individuals make about program participation, as well as their response over time:

The use of a small group discussion-decision approach during recruitment can influence the decision to participate as well as the adherence pattern over time. In their NASA study, the researchers used a recruitment method involving small group discussions and decision making and systematically compared it with a large group lecture approach. The findings indicated that the effectiveness of the small group discussion and decision method was not limited by the personal and social characteristics of the audience, or by difference in level of skill, or personal style of the group discussion leaders. This approach was more effective than a lecture approach regardless of the social class and lifestyle characteristics of the audience. The active involvement of the participants in the group discussion is likely to increase understanding and learning compared with the more passive reception of information obtained from a lecture. The small group context provides an individual with the opportunity to explore and evaluate the benefits and demands of the program participation.

Program participants should be able to maintain regular contacts with medical and other program personnel. The social-psychological value of this type of relationship cannot be overemphasized: it makes it possible to provide participants with the feedback, clarification, and support they need and want. In a study by Faulkner and Stewart (1977) on female employees, a "follow-up personal contact" by the program directors was found to be an effective technique in retaining participants in the fitness program.

Individuals may be motivated to exercise or participate in a physical activity program for other than health reasons. Some persons may participate because the program allows a change of routine, provides an opportunity for recreation or social contacts, increases their fitness for other games or sports (skiing, hiking, etc.) or enhances appearance. When efforts are made to promote exercise participation, the focus should be diverse and take into account a variety of motivating factors, health related or not.

Factors influencing an individual's decision to take part in an exercise program frequently differ from factors influencing his/her adherence to the program over time. Factors that influence initial participation in an exercise program may be concerned with health, desire for recreation, or a change in routine. Factors such as the organization and leadership of the program, the types of activities offered, and the camaraderie or social support that is generated may

be more instrumental in promoting adherence over time. Major efforts should be made to ensure that exercise programs organized on a group basis are administered in a manner to support rather than impede social development.

Volunteer participation in a supervised exercise program is positively related to level of socioeconomic status. Although this finding is consistent with the general social learning theory that the more highly educated are more likely to participate in a new health oriented behaviour, persons in higher social classes may simply have more time available to participate in exercise programs. Also, persons with a higher socioeconomic status may have more flexible schedules than those in lower social classes who are engaged in occupations requiring a more routine and fixed work role. This relevant factor highlights the need to establish exercise programs that allow flexible times for participation, as well as programs that can be conducted within various employment settings.

The attitude and reaction of those with whom an individual interacts determine whether or not he/she will participate, as well as influence the pattern of adherence over time. In order to promote effective exercise programs, the attention should focus not only on the participant, but also those to whom the individual relates most directly, and who are, therefore, likely to influence his/her attitudes and behaviour. A participant's spouse, friends and colleagues can play important roles in this sense. Persons who serve as "significant

others" should be adequately informed about the nature of the program, and be involved in it on a regular basis in order to support the individual's participation, rather than influence it negatively. Collis (1977) has suggested that employee fitness programs provide educational materials for the participants to take home to their spouse or friends so that they will encourage the person to adhere regularly to the program.

Wanzel and Danielson (1977) determined a number of factors which led to participant withdrawal from a company exercise program. A total of 480 questionnaires were distributed to employees who were known to have withdrawn from the company fitness program. Completed replies were received from 254 of the employees (52.9%). Major reasons for withdrawal from the program included:

1. crowded conditions during exercise sessions (14%)
2. the distance of the facility from home or place of work (42.5%)
3. the necessary rearrangement of a participant's daily schedule to accommodate exercise sessions (40.2%)

The exercise program was operated during non-job hours and the respondents to the survey were asked if the availability of exercise classes during office hours, two or three times a week, would have been a suitable alternative to their after-hours exercise periods and thus would have kept them in the program. 65.3% of the drop-outs were in agreement with this idea and 78% of the respondents felt that this type of scheduling would not have decreased their normal office productivity. These results led the investigators to conclude that

employers should investigate the possibility of adjusting individual work schedules to incorporate the workout periods of interested employees. This arrangement would ease the strain of fitness participation on an employee's daily schedule thus enhancing program adherence. As well, it would ease the strain of training during office hours and reduce the crowding of facilities. Other factors identified in this study which could help increase program adherence included:

1. A "buddy system" in which participants enroll and exercise with another person. This could prove especially effective with those who traditionally exercise alone, i.e. older participants and those with greater corporate responsibility. Only 34.9% of the respondents exercised with a friend or spouse.
2. Improve the motivational style of the fitness instructors. The instructor should ask each participant what motivational approach, if any, would be most helpful. Some people respond well to motivation by an instructor. Others work best with a friend's encouragement while still others respond best to peer group motivation. Participants should be consulted on how they wish to be motivated.
3. Participants should develop realistic objectives or steps that can be attained within a two-week period. One variable significantly related to withdrawal was attainment of exercise objectives. People who did not attain their objectives tended to drop out of

the program much faster than those who did attain them. General conditioning was the most often stated objective (70.9%) followed by improved heart and lungs (52.8%) and weight loss (46.5%). The researchers felt these objectives might be too general and should be further developed.

Bjurstrom and Alexiou (1978) have reported that 61% of the participants starting an employee exercise program were still participating at the end of one year. The retention rates for years two through five were 52%, 42%, 37% and 25% respectively and at year five the retention rate was significantly different for men (45%) and women (11%). Of those who dropped out during the first 15 weeks, 79% reported doing so because of lack of interest. Included were reasons of lack or loss of motivation, logistical difficulties associated with the program schedule and problems encountered with supervisors regarding time for program participation. Another 13% dropped out because of physical or medical problems and 8% because of changes in job status. During the remainder of the first year 81% of the drop-outs were reportedly due to lack of interest, change of job status increased to 18% and medical reasons decreased to 1%. Attrition occurring after one year of program participation resulted increasingly from changes in job status and decreasingly from lack of interest and motivation, particularly among male employees. In addition to the decrease in the percentage of attrition associated with medically related problems, the type of medical problems causing attrition became increasingly the type not likely attributable to program participation.

Foss (1979) investigated factors related to urban female population in physical activity programs. Major factors supporting or inhibiting the initiation and maintenance of physical activity programs were identified through a questionnaire survey of a random sample (N = 700) of nonstudent and nonretiree females.

Active versus inactive respondents differed significantly for several variables. Early sports experiences, particularly in elementary and junior high or middle school physical education classes and instruction in leisure-time sports and dance were important supportive factors. A greater proportion of active women than inactive women received encouragement to be physically active during childhood from their fathers, siblings and friends. Seventy percent of the active women participated in unsupervised physical activity programs, while thirty percent were supervised in programs provided by commercial and community agencies. Older women were more dependent upon exercise leaders to provide technical assistance. The investigator found that awareness of the aging process influences women to initiate programs, and health related factors motivate them to continue.

Many (50%) of the inactive women were interested in initiating physical activity programs (three times per week, thirty minutes per session) if time permitted. Their activity choices were the same as those practised by active women, namely jogging, calisthenics, swimming and tennis.

The investigator concluded that program directors and exercise leaders should consider previous and current motivational factors during the development and implementation of physical activity programs for female participants, so as to improve compliance, adherence and maintenance.

At a recent meeting of fitness directors in business and industry, Colacino (1979) identified factors that influence adherence to corporate health management programs. Factors included the organization and administration of the program, accessibility, corporate incentives, social aspects, evaluation and personal feedback. Reasons for dropping-out included time problems, lack of motivation, injury, poor facilities, poor leadership, intimidation by peers and other sources of activity.

Oldridge (1979) has recently reported several factors which influence compliance with cardiac exercise rehabilitation programs. Poor compliance rates have been associated with programs that require many restrictions or changes in personal habits. One of the main reasons for dropping out of an exercise therapy program has been lack of interest or motivation. Oldridge suggests that exercise programs should include more than an exercise prescription. He concluded that the exercise program should provide feedback to the participant and spouse about progress or lack of progress in cardiovascular fitness and explain the need for lifestyle changes. Additions to a well-rounded program should include relaxation and nutrition advice and social gatherings.

Collis (1977) has identified the following factors which influence attendance at adult fitness programs:

1. pre and post program testing
2. organization and leadership of the class
3. regularity and punctuality
4. rewards and recognition
5. knowledge of purpose
6. "esprit de corps"
7. variety
8. symbols of participation
9. use of motivational techniques
10. permissiveness and informality
11. easily accessible venue
12. personal attention

STRATEGIES FOR INCREASING ADHERENCE

Faulkner and Stewart (1977) have proposed that knowledge and understanding of effective promotional and motivational techniques in "recruiting" participants and "retaining" them in a fitness program would be invaluable to all sectors of society concerned with fitness programs.

They evaluated the effectiveness of various recruitment techniques in motivating an occupationally sedentary group of female employees to begin a fitness program. They also evaluated the effectiveness of various "short term" retention techniques in motivating participants to continue in an exercise program.

Their results indicated that a combination of a fitness assessment and educational seminars was the most effective technique for the "recruitment phase" of the project. A "follow-up" personal contact technique appeared to be most effective in retaining participants in the program. The participants received at least two follow-up phone calls regarding their involvement and progress in the program. The second most effective retention technique was the "test-retest". All the subjects received an initial fitness assessment and were aware that they would be retested for improvement. Only those subjects who attended at least an average of two sessions per week were considered retained. The investigators concluded that simple, direct appeals and procedures appeared to elicit a good response in terms of recruitment and retention.

Reid and Morgan (1979) studied compliance with exercise prescriptions among city firefighters. They hypothesized that adherence to regular exercise over a period of six months would increase with each of the following additions to the exercise prescription:

1. printed exercise instructions and a ten minute consultation with a physician (Groups 1, 2, 3).
2. a one-hour period of film and discussions (Groups 1 and 2).
3. knowledge of pulse taking, quantifying, recording of daily exercise, and reporting of this information (Group 3).

The subjects were tested after three and six months for change in aerobic capacity, indicating adherence to regular exercise. After three months, the subjects in the control group (Group 1) had a 29%

compliance rate, compared with 56% and 55% for Groups 2 and 3 respectively ($p = .02$). However, after 6 months, Groups 2 and 3 lost 40% of previous compliers, while the rate for Group 1 remained the same.

At the end of six months, only about a third of all three groups that started the program were exercising regularly.

The investigators concluded that "while a one-hour educational presentation initially motivated twice as many to comply as the control prescription, this effect was temporary".

Collingwood (1979) has reported than an "educational fitness program", i.e. an education program with little opportunity available for physical activity, had an effect on increasing activity levels of police officers. Two program goals were identified:

1. to provide an educational program to teach fitness program development and revision skills so that an officer can adhere to an individual program the rest of his life.
2. to provide a starter program whereby the officer starts getting used to physical activity.

Officers were taught exercise skills and management, and were provided with a training manual and other learning materials. The program was conducted over a two week academy course of which eight hours was devoted to the fitness educational curriculum. The follow-up period was nine to eleven months and consisted of a written questionnaire which the officers filled out and sent back for tabulations.

The results indicated that the education program by itself with little opportunity for physical exercise at the workplace had an effect in increasing the activity levels of the participants. Approximately half of the subjects dropped out of an exercise program after the six to nine month period.

The author reported three major factors to assure adherence:

1. education/training on individual program development and maintenance
2. reinforcement from administration
3. supervision for the initial conditioning period to monitor the most critical period - 6 weeks.

He concluded that with all three factors accounted for, the probability of adherence could be increased.

In 1975, the Dickshire Distributing Company of El Paso, Texas, initiated a program to encourage the maintenance and development of physical health of their employees (Hardin, 1979). The availability of cardiovascular fitness facilities and exercise opportunities, plus in-service education accompanied by prescriptive exercise suggestions resulted in a significant increase in the estimated Maximum Oxygen Uptake levels of the participants.

Pfeiffer (1977) has emphasized that the most direct and practical route to minimize the threat of cardiovascular disease is preventive health maintenance in the form of employee fitness programs and education programs which emphasize proper lifestyle practices.

Using basic economic concepts and models of human health behaviours, Everett (1979) found that the time and effort costs of exercise may exceed the present value of the economic benefits of improved physical fitness. According to the researcher, these high costs help explain the small incidence of consistent adult exercise and the lack of in-house, on-worktime employee exercise programs. He maintains that while health education campaigns may be useful, employers must find ways to reduce the time and effort costs of exercise by making it a low-cost byproduct of more immediately desired outputs or goals. He has suggested three ways to accomplish this:

1. Reintegrate physical activity into productive work. Most of the epidemiological studies showing a relationship between physical activity and reduced CHD studied productively employed workers. In spite of advanced mechanization, some opportunities for efficiently increasing physical activity on the job may exist. Employers could encourage executives, sales personnel and others who work on their own hours to utilize in-house exercise facilities as places to meet and exchange information, for example, rather than using coffee breaks and extended cocktail lunches. Since such informal meetings are essential for conveying information in many organizations, the time costs could be quite low and the potential benefits for highly paid employees substantial, if the exercise facilities were conveniently located. Some executives keep exercycles with reading stands in their offices for combining exercise and routine reading.

2. Facilitate and encourage labour-intensive transportation such as bicycling and walking combined with transit and carpooling.
These modes may save employees substantial monetary costs and in congested areas may take no more time than driving, thus providing exercise as a low cost byproduct.
3. Support and encourage vigorous sports. such as competitive hand and racquetball, swimming, basketball, soccer and running instead of golf, baseball, bowling and other light physical activities. Long-run health benefits from exercise become a low effort and low time-cost byproduct of the immediate competition and social interaction.

Brown (1979) has identified four groups, and strategies to market fitness to them when developing an employee fitness program:

1. Highly committed group: or "fitness buffs" who already exercise and will continue, regardless of what the program offers.
About 20% of any given employee population falls in this group. The fitness director should feed supportive information to this already convinced group.
2. High-receptivity group: estimated to be about 40% of the population, this group is the most receptive to change. For one reason or another, they seem ready to commit themselves to a fitness program. Approaches to influence this group include healthy hazard appraisal or risk factor analysis, educational sessions, specific data feedback, counselling and peer support.

3. Low-receptivity group: usually about 30% of the population who, for one reason or another are not as "primed" as the high receptivity group. Emphasis should be given to the enjoyment aspect of exercise. Also, because many people in this third category tend to come into the program to lose weight, a steady flow of information on weight control helps motivation.
4. Professional dropouts: about 10% of the employee population, this group will drop out of the program within the first four weeks. They have experienced a great deal of failure when attempting to modify behaviour. One of the most important factors for attracting and keeping members of this group is the enthusiastic leader who takes special interest in their progress. Individual counselling should be stressed with this group.

COMPONENTS OF AN EMPLOYEE FITNESS PROGRAM

Collis (1977) in the Canadian government publication Employee Fitness identified ten steps to the development of an employee fitness program:

1. demonstrated requirement for fitness program, e.g. questionnaire
2. formation of fitness committee (medical, union, managerial and employee involvement)
3. appointment of a fitness director
4. establishment of initial exercise testing facility and activity areas

5. awareness campaign and sensitization process
6. fitness testing and exercise counselling
7. pilot program of limited numbers and duration
8. collection and analysis of pilot program data
9. publicize initial success and create a demand
10. expand program and facilities and institute leadership training.

In addition, Collis noted twelve common features of successful programs:

1. strong leadership
2. administrative support, with personal and financial commitment
3. accessibility (on-site or nearby facilities)
4. availability
5. assessment (continuing evaluation of fitness, anthropometry and performance)
6. recording (techniques should be devised for monitoring the progress of participants)
7. group exercise
8. challenging physical programs
9. continued motivation, stimulation and incentive
10. organization
11. visibility and variety
12. continuity and extension (the program should work with related company and community organizations).

Haskell (1978) summarized the following components of a successful employee fitness program: (a) the involvement of knowledgeable and enthusiastic leadership; (b) a program in which participation is reasonably convenient; (c) adequate instruction on why and how to exercise; (d) provisions for a variety of appropriate activities to meet different needs and interests; (e) support by peers, supervisors and family for continued participation; (f) establishment of short and long range goals with periodic assessment and appropriate recognition or awards. He emphasized that these arrangements: "...appear important in order to elicit long-term participation by a substantial percentage of employees".

SUMMARY

A positive and consistent relationship exists between employee fitness program effects and program adherence. Numerous studies have identified a variety of factors which influence the initiation and the maintenance of exercise programs by adults. Investigators have proposed a number of strategies for increasing the rate of adherence to employee fitness programs. It appears necessary to include certain components when designing and implementing an employee fitness program in order to elicit long-term participation by a significant number of the employee group.

Chapter 3

METHODS AND PROCEDURES

Subjects

Fifty female employees from Peace Arch District Hospital in White Rock, B.C., volunteered to take part in the pilot employee fitness program. Each of the subjects was randomly assigned to one of three groups. The mean ages were 36.6 years for Group 1, 36.0 years for Group 2 and 36.7 years for Group 3. Thirty-three subjects, representing 66% of the sample, were married. The subjects were physically inactive according to the recommended activity-need standards published by the American College of Sports Medicine (1978).

Each group participated in a lifestyle and fitness assessment but was otherwise distinguished as follows: Group 1 was assigned to the exercise facility, exercise classes and the education and motivation program. Group 2 was assigned to the exercise facility and exercise classes. Group 3 was assigned to the education and motivation program.

Time and Duration of the Study

The Employee Fitness Program was conducted over a twelve week period, from the beginning of March, 1979, to the end of May, 1979. The lifestyle and fitness assessment was held one week prior to the implementation of the program. Post testing was conducted during the week following the cessation of the program.

Personnel

The investigator, a fitness consultant for Action B.C., was appointed as the Employee Fitness Coordinator for Peace Arch District Hospital. Action B.C. staff assisted the investigator during the testing period.

PRE-PROGRAM PROCEDURES

Action B.C. was contacted in November, 1978 by a group of employees from Peace Arch District Hospital (P.A.D.H.) who were interested in the implementation of an employee fitness program. A tour of the hospital by Action B.C. consultants revealed a large, generally unused area which would prove acceptable for exercise testing and classes. The area surrounding the hospital was found to be conducive to jogging and walking classes.

Upon the recommendation of Action B.C., the group formed a Fitness Committee whose purpose it was to demonstrate a requirement for a fitness program by the employees of the hospital. The committee was to determine the number of staff interested in participating, the number of exercise classes and proposed times, and the types of activities which would appeal to the employees. Also, the committee was to determine available resources, establish a budget and obtain approval from the administration of the hospital. Involvement from 5% of the staff, i.e., 22 employees, was considered a minimum number

for starting a program. Action B.C. emphasized to the committee, the importance of this initial groundwork in the construction of a successful pilot program.

In December, 1978, a memorandum describing the proposed employee fitness program was distributed to the administration, department heads and staff of P.A.D.H. by the chairman of the Fitness Committee. The memorandum outlined the formation of the proposed pilot program and noted the preliminary approval by the hospital administration. An invitation was extended to all staff for a meeting with the Fitness Committee to discuss the proposed pilot program. This meeting, held in December, 1978, concluded:

- a) the minimum number of times per week for employee participation in the program is three,
- b) department directors may consider scheduling flexible working hours on an individual basis to facilitate participation in the program, and
- c) work must be up-to-date before the employee attends.

The program was to be assessed for its effectiveness and usefulness in the hospital at the end of a twelve week trial period.

In January, 1979, Action B.C. appointed the investigator as the fitness coordinator for the P.A.D.H. Employee Fitness Program. The investigator met with the Fitness Committee and was informed of the developments involved with the program thus far. A commitment of two days a week of employment time was established for the investigator to help coordinate the program.

The investigator and committee initiated an awareness campaign to publicize the implementation of the program. Various responsibilities were delegated to the members of the committee and the campaign included a poster and pamphlet program, a special "get fit" issue of the hospital newsletter and a Peace Arch Fitness Promotion Day.

A schedule and description of classes was drafted by the investigator and submitted to the committee for inclusion in the hospital newsletter. The investigator also provided a small group of employees with a Fitness Leaders Training Program. This program provided the group with some of the theoretical and practical background necessary to lead a fitness class.

A program proposal identifying the design, objectives and the research component was submitted to the administration for final approval prior to the implementation of the program (Appendix 1).

LIFESTYLE AND FITNESS ASSESSMENT

Action B.C.'s Health Promotion Program was used for the lifestyle and fitness assessment and included the Health Hazard Appraisal, three day nutrition evaluation and functional fitness tests. The Tennessee Self Concept Scale (T.S.C.S.) was also included. One week prior to the assessment, fifty employees received the H.H.A., nutrition evaluation worksheets and the T.S.C.S. testing booklet and answer sheet for self administration. The results from the H.H.A. and the nutrition evaluation were used in conjunction with the results from

the fitness assessment to provide lifestyle counselling and prescriptive exercise suggestions (American College of Sports Medicine Position Statement, 1978). The results of the T.S.C.S. were not revealed to the employees.

Counselling was conducted on a one to one basis and employees were advised as to the specific programs open to them for the duration of the pilot period. All employees received the same counselling information during the session and were encouraged to adhere to the prescribed exercise suggestions. Individual needs regarding exercise were also discussed at this time.

Participants received progress cards which were collected monthly. Due to the number of varying shifts within the hospital, collection of these cards on a weekly or bi-weekly basis was not considered feasible. Participants were encouraged to keep up-to-date and accurate records. Perusal of the progress cards revealed accurate record-keeping by a majority of the participants. These cards monitored personal progress and provided the primary assessment of adherence to the prescribed exercise suggestions.

The functional physical fitness assessment included cardiovascular, body composition and flexibility measures. An electronic, computerized bicycle ergometer, the Dynavit, was used to assess cardiovascular fitness.

Kuntzelman's (1975) method for determination of percent body fat was utilized. Harpenden skinfold calipers were used and the locations of tissue measurements were the triceps and the suprailiac.

The flexibility measures included the sit and reach, back extension and shoulder extension tests. The test methodology and normative tables are contained in the Action B.C. Functional Fitness Appraisal Test Manual (Sinclair and Rhodes, 1977).

The Physical Activity Readiness Questionnaire (PAR-Q) was used for pre-test screening. The PAR-Q was developed as a first level screening device prior to conducting non-medical monitored exercise tests (Chisholm et al., 1975).

The post-program lifestyle and fitness assessment was conducted one week after the cessation of the program.

TESTS

The Dynavit Test for Cardiovascular Fitness

The Dynavit computerized bicycle ergometer was designed to clinical standards for both exercise tolerance testing and exercise training (Dynavit, 1978).

The Dynavit ECG amplifier accepts inputs from chest electrodes or from a plethysmograph type pulse sensor. ECG signal processing detects the blood wave at the finger tip when finger-type sensors are used. The ECG circuit is free from exercise induced artifacts. The computer accepts signals from the ECG amplifier and determines heart rate using a crystal controlled time base to period average 25 beats with beat-by-beat updating. This technique provides a highly accurate digital display plus easy recognition of an increasing, decreasing or steady state heart rate (Dynavit, 1978).

The keyboard is used to enter each subject's age, weight and sex which are used in calculating output data. Data output is displayed by keyboard selection and includes: elapsed time of exercise, heart rate, cumulative caloric costs, workload, age, weight, target rate maximum, exercise time and intensity cumulative units (Dynavit, 1978).

Based upon measured performance and heart rate, the computer calculates a score of an individual's aerobic capacity auto-corrected for age, weight and sex differences. The projected index is compatible with the table of Cardiorespiratory Fitness Classification as published by the American Heart Association in Exercise Testing and Training of Apparently Healthy Individuals: A Handbook for Physicians (1972) (Dynavit, 1978).

The Meditronic model used in this study also provides data output (calculations and projections) of oxygen uptake at 170 BPM (Dynavit, 1978). The predicted oxygen consumption score at PWC 170 was used in this study. Hockey (1979) has defined this score as "a prediction of what the oxygen consumption for the subject would be if he were to work at a task which would elevate his heart rate to 170 beats per minute". The score is expressed in ml/kg/min and was computed when the subjects reached a steady state for three minutes in the target heart range. The target heart rate range is calculated and displayed by the ergometer. It is based principally on a percentage of the predicted maximal heart rate with the percentage varying between 70 and 80 percent depending on the age (Hockey, 1979).

In a report of a study using both the Dynavit and Monark bicycle ergometers, Edington (1979) concluded: "...it appears clear from the data in this study the results of treadmill testing and bicycle ergometer testing are in agreement".

Hockey (1979) states that maximal oxygen uptake values may be predicted quite accurately using the Dynavit and has concluded: "...the Dynavit Bicycle ergometer may very adequately be used for administration of a stress test to evaluate cardiovascular efficiency".

Tennessee Self Concept Scale

The Tennessee Self Concept Scale is a self administered test comprised of 100 self descriptive statements which the subject uses to portray a picture of herself. The T.S.C.S. was designed for ages 12-68 years, is standardized and has published norms. The scale has a retest reliability of .88 (Fitts, 1956) and has been cross-validated with several other measures of self concept (Black, 1976). The T.S.C.S. gives a total positive or "P" score that indicates overall level of self esteem (Fitts, 1970). The "P" score was used in this study. As well, the Counselling Form used in this study was designed for use by administrators who are unsophisticated in psychometrics analysis.

Black (1976) made an exhaustive search to determine the instrument which could best measure self concept. He concluded that the T.S.C.S.:

1. Examines the many facets of self concept; it is a multivariable instrument.
2. Yields scores that identify the contribution of facets of self concept to the total self concept.
3. Is based on a substantial body of knowledge derived from several years of research and over 400 studies in which it was utilized.
4. Has been reviewed favorably by several psychologists and personality measurement specialists.

A number of researchers has studied the relationship between physical fitness and self concept. Christian (1969) correlated five indices of physical fitness with T.S.C.S. measures of self concept and found that muscular endurance, the cardiovascular index and the overall fitness index were significantly and positively correlated with the physical self score on the T.S.C.S. Similar results have been reported by Smith (1970), Neale (1969) and Hillison (1969). Albinson (1974) found that physically active college males tended to have better self concept.

Johnson (1968) studied the changes in self concepts during a physical development program and concluded: "...the presence of notable changes in self concept strongly suggests that an individualized physical development program can be of significant value in the total functioning".

Darden (1972) has stated: "...it is generally agreed that there is a relationship between an individual's physique and his personality. This relationship is primarily indirect; a person's body image affects his self concept which in turn influences the development of his total personality".

Fitts (1956) has concluded that "considerable evidence exists to indicate that people's concepts of self do change as a result of significant experiences".

The Health Hazard Appraisal

The H.H.A. allows computation of a subject's "physiological" or "appraised" age based on risk factors derived from a relatively short and simple questionnaire which the individual has answered (Taunton, 1978). A computer program rates the subject's potential risk for the top 12 causes of death for that particular age and sex. The print-out shows how the specific risk factors can be reduced by following certain lifestyle modifications. Compliance with these modifications results in a decrease in the "appraised" age, thus moving towards a recommended "achievable" age. Examples of lifestyle modification include regular exercise, reduction of alcohol and smoking and the use of a seatbelt (Taunton, 1978).

The five main causes of death in Canada include (Lalonde, 1974):

1. Motor Vehicle Accidents
2. Ischaemic Heart Disease
3. All Other Accidents
4. Respiratory Diseases and Lung Cancer
5. Suicide

Lalonde (1974) has stated: "...It will be noted that self-imposed risks and the environment are the principal or important underlying factors in each of the five major causes of death between age one and age seventy, and one can only conclude that, unless the environment is changed and the self-imposed risks are reduced, the death rates will not be significantly improved".

Self-imposed risks that can lead to various causes of mortality include cigarette smoking, over-eating, high fat intake, lack of exercise and lack of relief from work and other pressures.

The H.H.A. was originally designed as a tool to help private medical practitioners counsel patients about ways to improve their health but in recent years has been used in the business community as a motivational tool to reduce employees' risks (Employee Health and Fitness, 1980).

Ladou (1979) has suggested that the H.H.A. can be a useful tool to change behaviour. His four year follow-up of one employee group showed a net risk reduction of 2.38 years per person. His most recent study looked at the risk reduction of 26 examinees, and the results were consistent with an earlier study that showed a 1.4 year net risk age reduction for a one year follow-up on 107 employees (Employee Health and Fitness, 1980).

The net risk reduction in the "appraised" age was used in this study as the way to determine compliance with the recommended life-style modifications. Specific risk factors were not analyzed due to

the large age range of the sample where the lifestyle risks can vary greatly from person to person.

The H.H.A.'s used in this study were obtained from and processed by the Division of Health Systems, Health Sciences Centre, University of British Columbia.

Action B.C. Nutrition Evaluation

The nutrition evaluation was used in this study primarily to assess the activity levels of the subjects over a three day period. The computer print-out provides an averaged caloric expenditure for the three days reported by the subject. To complete the physical activity data on the evaluation form, the subjects were instructed to accurately list the number of hours spent in each activity category. The categories included:

1. Sleeping, resting.
2. Sitting (at home, in car, on bus), eating meals, watching T.V., standing still, most office work.
3. Moving quickly, walking, or brisk sports activity, working with hands, using physical effort for work or play.
4. Performing a physical activity that uses a high degree of effort - running, playing hard, swimming, dancing, skating, cycling.

The computer print-out also identifies excesses or deficiencies in the diet and was used during the counselling session to provide the subjects with nutritional counselling and recommendations.

EMPLOYEE FITNESS PROGRAM

The Employee Fitness Program consisted of:

- a) a lifestyle and fitness assessment;
- b) an exercise facility within the hospital and various exercise opportunities including exercise classes;
- c) a weekly education and motivation program.

The schedule of fitness classes offered various programs to accommodate the fitness levels of the employees and the number of varying shifts within the hospital. The exercise classes stressed the main components of physical fitness namely, cardiovascular capacity, flexibility and muscular strength and endurance, and were designed according to current principles of exercise. A "Start Fit Lunch Break" was offered during the noon hours and stressed mainly flexibility and range of motion exercises. A short cardiovascular segment was also included. This program was designed primarily to acquaint the beginner with the proper approach to exercise and to offer a refereshing mid-day break. The more vigorous "Keep Fit" classes were offered after work and were designed primarily as an aerobic workout. Flexibility and muscular endurance exercises were also included. These classes offered a vigorous Exercise to Music format. Classes were conducted on Mondays, Tuesdays and Thursdays (Appendix 3).

All classes were conducted in the P.A.D.H. Exercise Room with the exception of a jogging program which took place on several routes

surrounding the hospital. An "Aerobic Circuit" was housed within the exercise room to facilitate activity when no classes were offered.

The education and motivation program was available weekly and consisted of films, lectures and workshops (Appendix 4). This program was instruction oriented and geared towards general health promotion. It stressed the importance of physical activity, stress reduction, smoking cessation and the general enhancement of health. This component was designed after a similar program conducted at the Canada Life Assurance Company in Toronto (Peepre, 1978) and utilized a number of health promotion workshops offered by Action B.C. Such a component is considered an integral part of a "complete" fitness program in that it not only motivates individuals to continue exercising, but it also enhances their knowledge of the role exercise plays in relation to general good health (Peepre, 1978). This program offered a supportive role in order to maintain interest in a regular physical activity routine. All classes were conducted in the Exercise Room during lunch hours on Wednesdays and Fridays.

An Employee Fitness Bulletin Board and a Health and Fitness Library were located in the Exercise Room. As well, a pamphlet display was located in the cafeteria. Educational handouts were available at some of the education classes. Communication for the program was facilitated through the hospital newsletter, the bulletin board and a Fitness Memo Board in the hospital cafeteria (Appendix 5). The investigator was available to the employees for personal consultation twice a week.

EXPERIMENTAL DESIGN

The study used a 3X2 factorial design with repeated measures on the second factor for Hypotheses 1 and 2. The independent variables were the treatment factor with three levels (Group 1, Group 2, Group 3) and the time factor with two levels (Pre, Post). The experimental design employed for Hypothesis 3 was a 2 X 2 factorial design with repeated measures on the last factor. In this case, the independent variables were the treatment factor with two levels (High vs. Low Adherence groups) and the time factor with two levels (Pre, Post). Eight dependent variables were measured: predicted oxygen uptake, sit and reach, shoulder extension, back extension, percent body fat, caloric expenditure, "appraised" age and self concept.

DATA ANALYSIS

The U.B.C. BMDP2V repeated measures ANOVA program (Halm, 1977) was performed to ascertain any differences that occurred in functional physical fitness, "appraised" age, T.S.C.S. and caloric expenditure over the course of the program and between the groups.

The Chi-square test of independence (U.B.C. SPSS, 1978) was used to ascertain any differences in the adherence rate between the three groups.

Chapter 4

RESULTS AND DISCUSSION

Fifty subjects volunteered to take part in the employee fitness pilot program at Peace Arch District Hospital, White Rock, B.C. They were divided into three nearly equal groups; all completed a lifestyle and fitness assessment and were requested to improve their fitness by participating in a regular exercise routine and improving pertinent health habits. Group 1 also had available to it and was encouraged to participate in (a) a fitness and lifestyle educational program and (b) an on-site exercise program. Group 2 also had available to it and was encouraged to participate in the exercise program. Group 3 also had available to it and was encouraged to participate in the educational program. At the end of the pilot period, twelve subjects were unable to take part in the retest due to illness, vacation, pregnancy, change of job or loss of interest. These subjects were eliminated from the study.

The relationships between the selected component combinations of the program and adherence were assessed from data from an amended sample of thirty-eight subjects. Basic descriptive data for the subjects are summarized in Table 1. The three groups were of nearly equal numbers and mean ages.

Table 1
Subject Data

Group	n	Age (years)	S.D.
		\bar{x}	
1	12	34.8	10.6
2	13	36.2	10.2
3	13	35.1	12.3

The different combinations of motivational and practical components were introduced into the work place with the intention of determining:

- a) if the total program would improve the physical activity levels, physical fitness, self concept and lifestyle risk factors of the employees (Hypothesis 1 of this study).
- b) if the group with all of the motivational and practical components in its program showed (i) a higher rate of adherence to a regular exercise routine, (ii) a greater improvement in the variables used in the study, than the two groups with lesser numbers of components in their program (Hypothesis 2 of this study).
- c) if there was any relationship between high and low adherence to the employee fitness program and the amount of change over the course of the study in the measured variables (Hypothesis 3 of the study).

Results of the Employee Fitness Pilot Program

The following results deal with a basic theme underlying this investigation which is to study the effects of a twelve week employee fitness pilot program on the physical fitness, physical activity, lifestyle risk factors and self concept of the employee sample.

The means and associated standard deviations for the eight dependent variables for the three separate groups are given in Table 2.

Table 2

Observed Cell Means for Groups 1, 2 and 3

Dependent Variable	Group 1		Group 2		Group 3	
	Pre (S.D.)	Post (S.D.)	Pre (S.D.)	Post (S.D.)	Pre (S.D.)	Post (S.D.)
Pred. MVO ₂ (ml/kg/min)	26.4 (3.7)	26.6 (3.2)	26.1 (4.7)	27.5 (4.6)	25.8 (4.7)	27.1 (4.7)
Sit/Reach (cm)	32.7 (5.5)	32.8 (7.2)	37.2 (4.5)	39.4 (3.5)	33.6 (8.3)	33.4 (7.2)
Shoulder Ext. (cm)	20.5 (8.2)	22.9 (9.1)	16.0 (6.4)	19.5 (7.1)	20.4 (12.9)	22.5 (13.6)
Back Ext. (cm)	34.9 (8.8)	38.3 (9.8)	29.8 (9.8)	32.4 (11.7)	26.4 (10.8)	28.9 (12.4)
Body Fat (%)	24.1 (6.8)	23.1 (4.9)	23.2 (4.6)	22.2 (4.2)	25.3 (4.9)	25.0 (5.0)
"Appraised" Age (yrs)	34.8 (11.4)	34.5 (11.2)	34.5 (11.2)	34.5 (11.5)	35.1 (15.2)	35.1 (14.4)
Cal. Exp. (kcal/s)	2110.8 (338.9)	2334.8 (187.0)	2203.5 (256.9)	2247.8 (250.3)	2329.7 (386.3)	2341.3 (402.7)
T.S.C.S.* *(n=21)	348.7 (31.9)	374.3 (26.9)	356.4 (17.7)	360.0 (28.5)	320.2 (29.1)	320.2 (42.0)

The marginal means i.e. the means averaged over the three groups, and the F values obtained from the ANOVA tables are indicated in Table 3. For examination of the complete ANOVA tables see Appendix 7. Figures 1 through 8 give graphic representations of the data from Table 3.

Table 3
Marginal Means and F Values

	Marginal \bar{x}_1 \bar{x}_2		Hypothesis Mean Square	F Value
MVO ₂ (pred.)	26.1	27.1	17.09	8.42*
S & R	34.5	35.2	9.16	2.84
S. Ext.	19.0	21.6	134.92	6.95*
B. Ext.	30.3	33.1	153.09	6.49*
% B.F.	24.2	23.4	10.11	4.24*
"App." Age	34.8	34.7	0.23	0.25
kcal/s	2217.4	2307.3	165374.09	6.21*
T.S.C.S. (n=21)	345.2	355.3	934.40	3.82

*Significant at .05

Table 3 shows significant F values for five of the eight dependent variables. The predicted maximum oxygen uptake, shoulder and back extension, percent body fat and caloric expenditure showed improvement over the twelve week period.

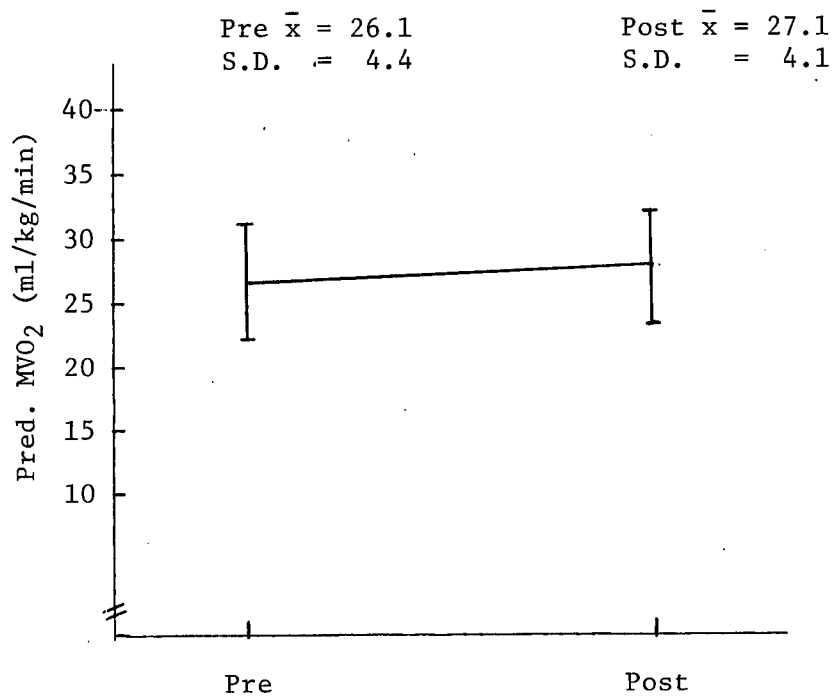


Figure 1. Predicted Oxygen Uptake

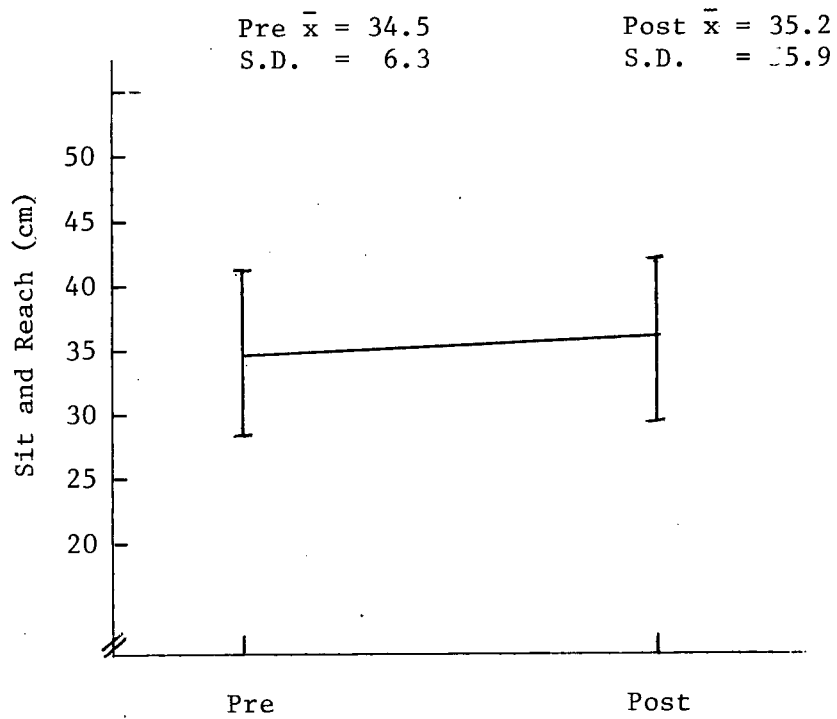


Figure 2. Sit and Reach

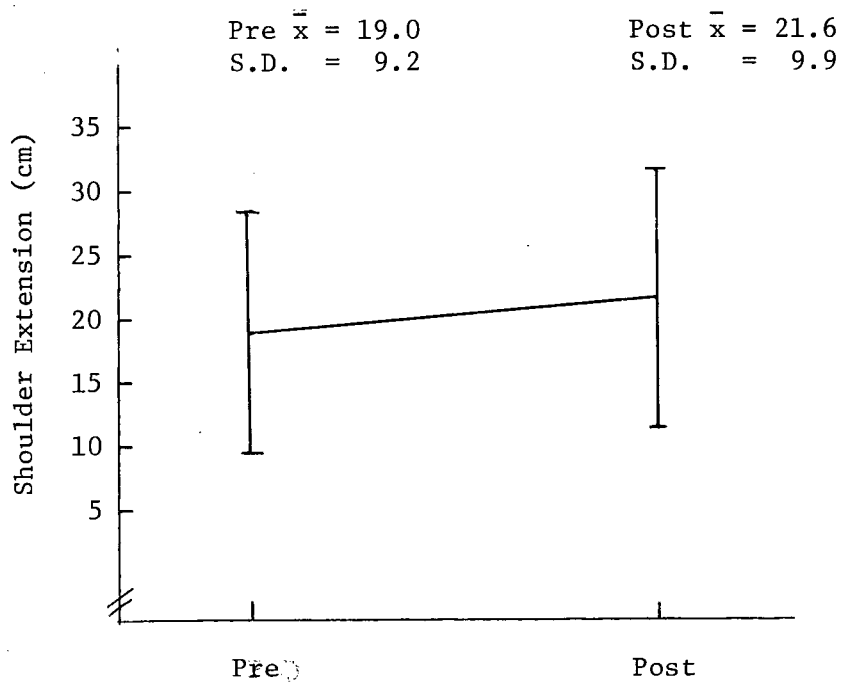


Figure 3. Shoulder Extension

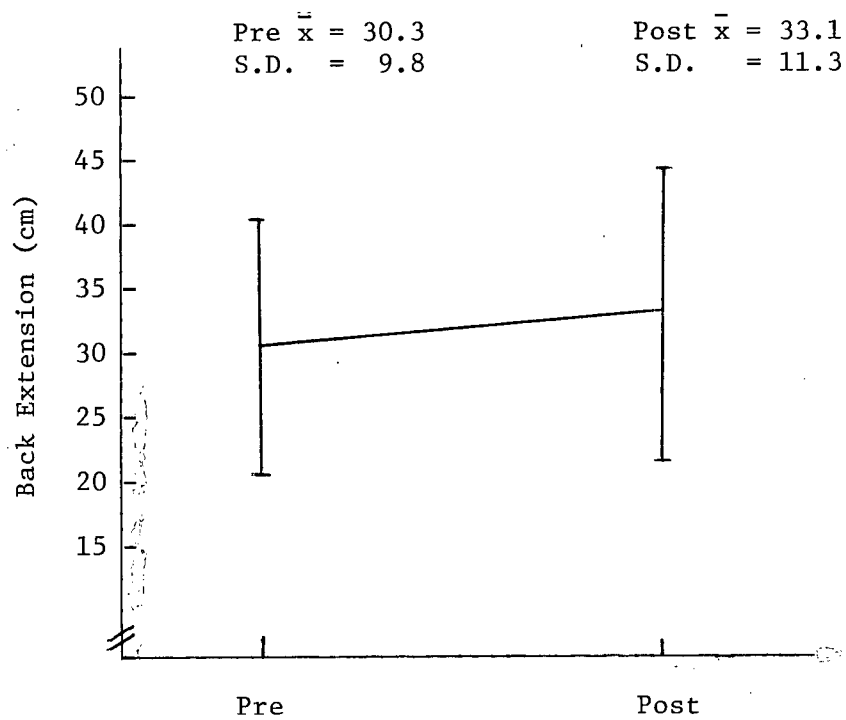


Figure 4. Back Extension

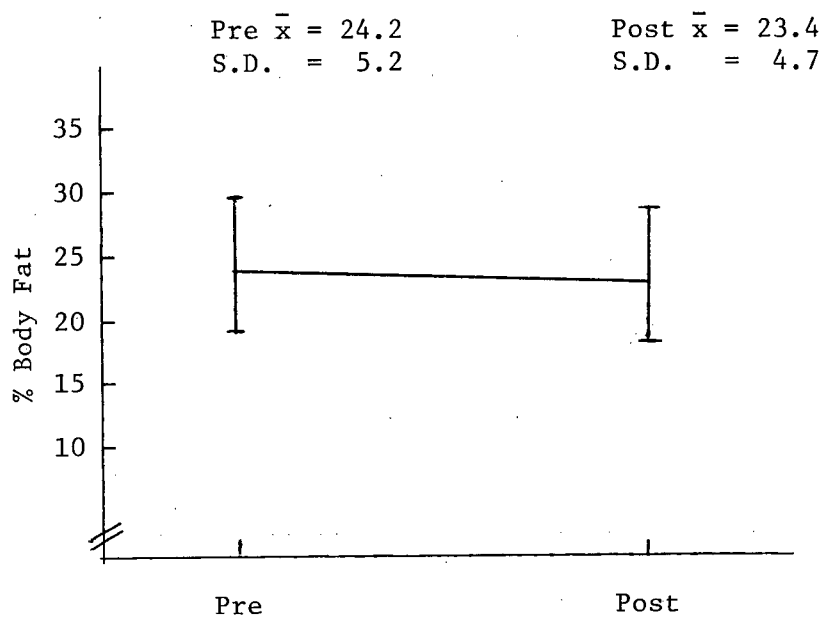


Figure 5. % Body Fat

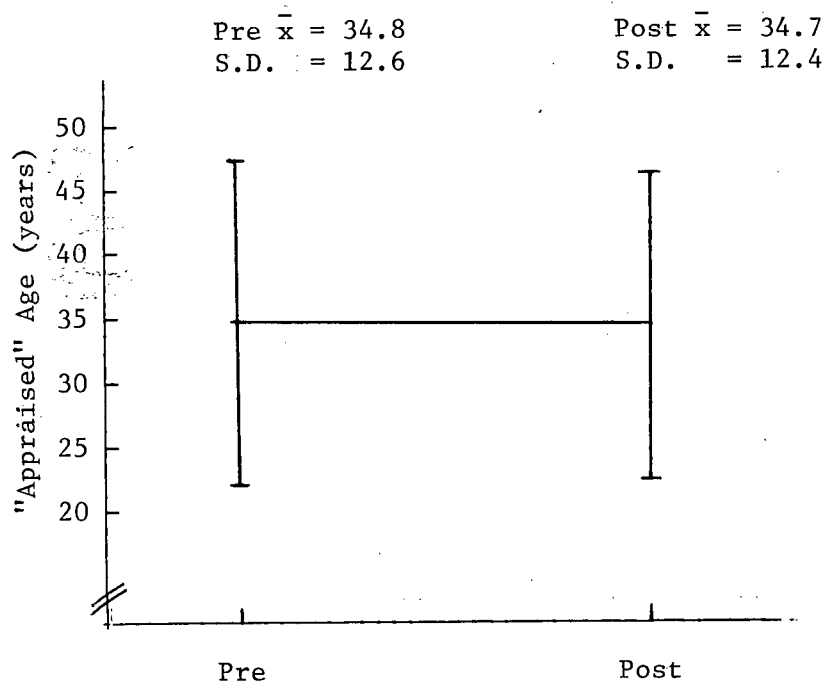


Figure 6. "Appraised" Age

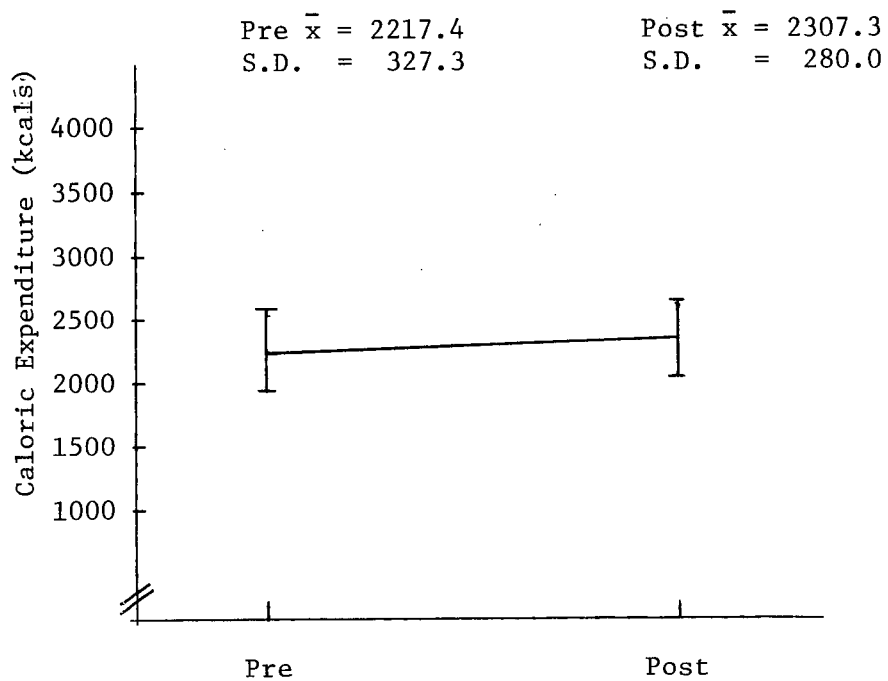


Figure 7. Caloric Expenditure

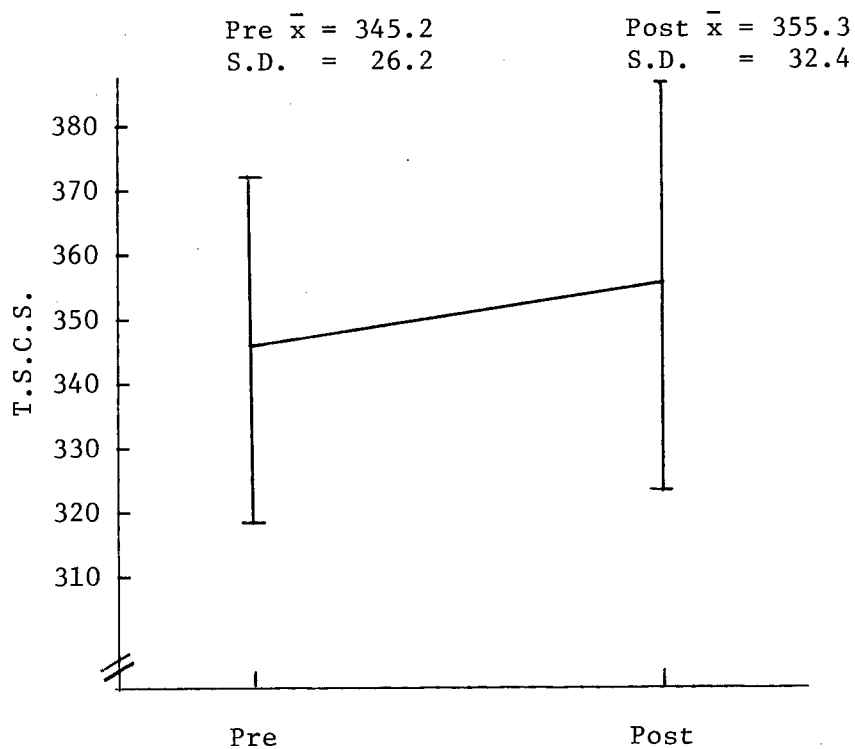


Figure 8. Tennessee Self Concept Score

The first hypothesis dealt with four categories of the dependent variables:

- a) Caloric expenditure was estimated to assess the physical activity of the subjects.
- b) Physical fitness was assessed using five variables: predicted maximum oxygen uptake, percent body fat, sit and reach, back extension and shoulder extension.
- c) The Tennessee Self Concept Scale was used to measure changes in self concept over the pilot period. Only twenty-one subjects returned both completed self evaluation questionnaires so that results can only be attributed to just over half the sample (55.2%).
- d) The Health Hazard Appraisal yielded an "appraised" age which determined lifestyle risk factors.

Results: The Selected Program Components and Adherence

The Chi-square test of independence was used to ascertain any differences in the adherence rate between the three groups. The results obtained from the Chi-square are presented in Table 4. The tables of data from the Analysis of Variance employed to discern significant changes in the groups (G X T interaction) over the pilot period, are contained in Appendix 7.

Table 4

Chi-square Test of Ind.
(Crosstabulation of Groups by Adherence)

Group	Count Row Pct Col Pct Tot Pct	Adherence		Row Total
		High	Low	
		1	2	
1		4	8	12
		33.3	66.7	31.6
		36.4	29.6	
		10.5	21.1	
2		5	8	13
		38.5	61.5	34.2
		45.5	29.6	
		13.2	21.1	
3		2	11	13
		15.4	84.6	34.2
		18.2	40.7	
		<u>5.3</u>	<u>28.9</u>	
	Column	11	27	38
	Total	28.9	71.1	100.0

Raw Chi-square = 1.84702 with 2 Degrees of Freedom
Significance = 0.3971

Hypothesis 2 has two parts. Part A indicated that the employees in Group 1 would demonstrate a higher rate of adherence to a regular exercise routine when compared with employees in Groups 2 and 3. Part B of the hypothesis proposed a significantly greater change in the dependent variables for those employees in Group 1 compared with those in Groups 2 and 3. This was related to expectations of a higher rate of adherence.

The Chi-square table shows that high adherence to a regular exercise routine was maintained by 33.3% of the subjects in Group 1, 38.5% in Group 2 and 15.4% in Group 3. Eleven of the thirty-eight employees (28.9%) were classified as high adherence participants. Of the high adherence participants, 36.4%, 45.5% and 18.2% came from Groups 1, 2 and 3 respectively. The raw Chi-square value of 1.84702 (2df) indicates that no significant difference existed between the groups in adherence. Thus Part A of Hypothesis 2 was not supported by the data.

Part B of Hypothesis 2 required testing by Analysis of Variance design for comparing the three single group improvements inter alia. The groups-by-tests interaction (G X T) was used to determine the existence, if any, of significant differences between group improvements in the dependent variables over the period of the study. The G X T interactions obtained indicate that only one variable (Sit and Reach) showed a significant difference between groups in the amount of improvement made (Table 5).

Table 5

ANOVA Table for Sit and Reach

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	458.83	2	229.41	3.04	0.06
Tests (T)	9.16	1	9.16	2.84	0.101
G X T	21.51	2	10.75	3.33	0.047

A graphic representation (Figure 9) of the data for the sit and reach variable from Table 2 indicates that the groups did not all change similarly from the pre to post tests. Groups 1 and 3 virtually stayed the same, while Group 2 showed an increase in performance of 2.2 cm. The hypothesis, however, proposed a significantly greater change in the dependent variables for those employees in Group 1 compared with those in Groups 2 and 3. Part B of the Hypothesis 2 then, is not supported by the data.

Results: High vs. Low Adherence Participants

The third hypothesis of this study dealt with the relationship between adherence (high or low) and the amount of change in the measured dependent variables from the pre to post tests.

The means and associated standard deviations for the High vs. Low Adherence participants are presented in Table 7. Figures 10 through 17 give graphic representations of these data. The tables of results of the Analyses of Variance used to analyse differences in the way the two groups changed (G X T interaction) over the pilot period, are contained in Appendix 8.

Due to the unequal number of subjects in the high adherence (n=11) and low adherence (n=27) groups, caution is necessary in the interpretation of the F and p values obtained and shown in the ANOVA tables. It has been shown (Box, 1954) that minimal "bias" occurs with unequal n if cell variances are equal. However, for five of the

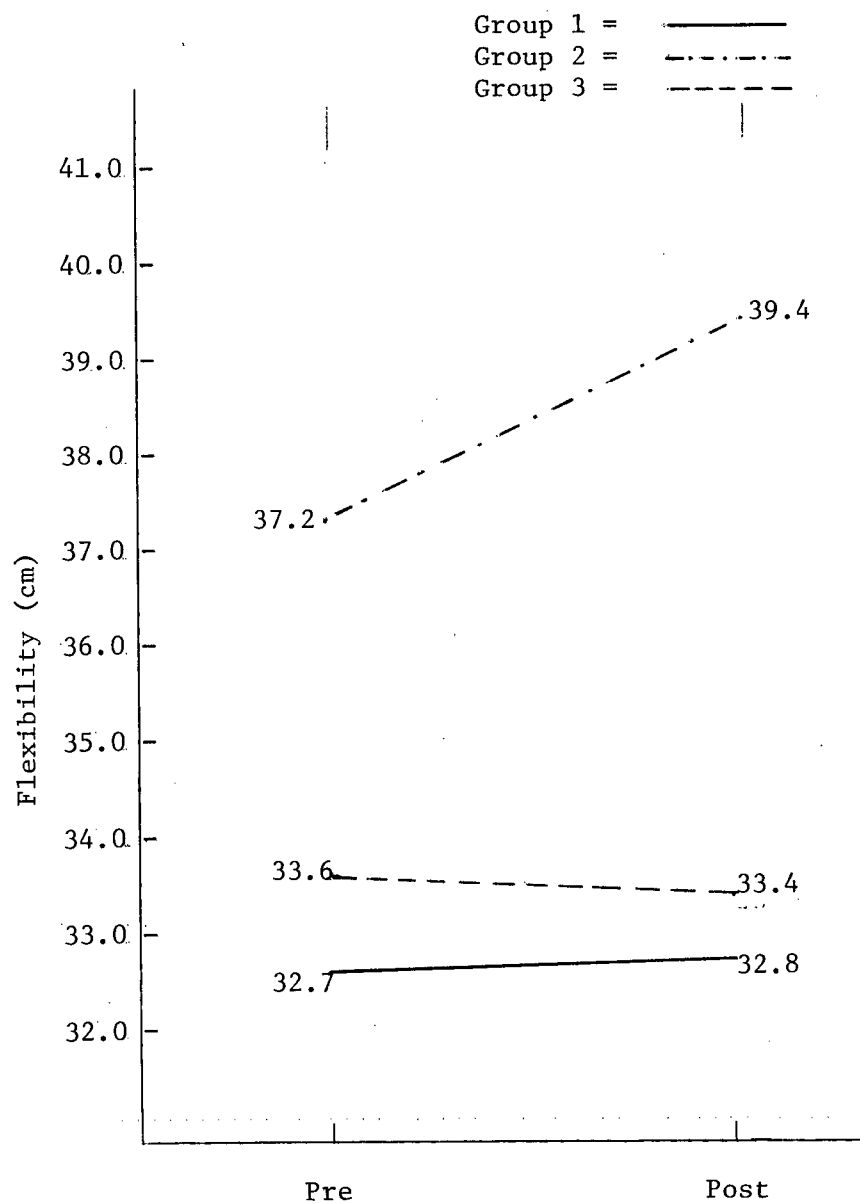


Figure 9. Sit and Reach (cm)

dependent variables, namely the sit and reach, shoulder extension, "appraised" age, caloric expenditure and T.S.C.S., there were large differences among the cell variances. These variables, therefore, are not considered appropriate for statistical analysis. The investigator, however, will note any trends that occurred for these variables which are pertinent to the hypothesis discussed in this section.

The Chi-square table presented in Table 4 indicates that eleven of the thirty-eight employees, or 28.9%, were classified as high adherence participants. The remaining twenty-seven employees (71.1%) were considered low adherence participants.

Testing Hypothesis 3 calls for an examination of the ANOVA results considered appropriate for statistical analyses due to minimal "bias". The groups by tests interaction (G X T) was analysed in the ANOVA tables for predicted maximum oxygen uptake, back extension and percent body fat. The G X T interactions for these three variables show significant F values. The observed cell means (Table 6) indicate the greatest improvements for the high adherence participants. These are displayed graphically in Figures 10, 13 and 14.

The cell means (Table 6) for the five variables deemed inappropriate for statistical analyses indicate a greater change from the pre to post test for the high adherence participants in each case. This trend can be noted in Figures 11, 12, 15, 16 and 17.

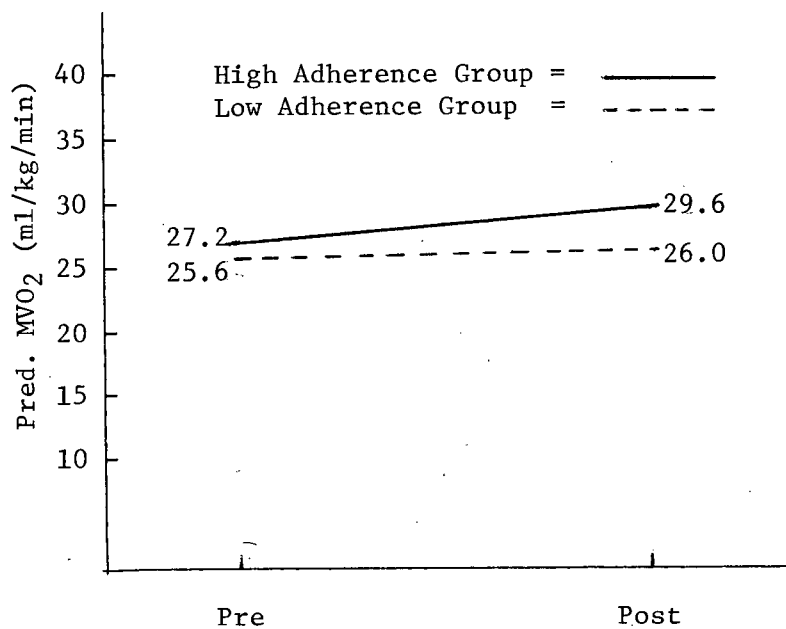


Figure 10. Predicted Oxygen Uptake

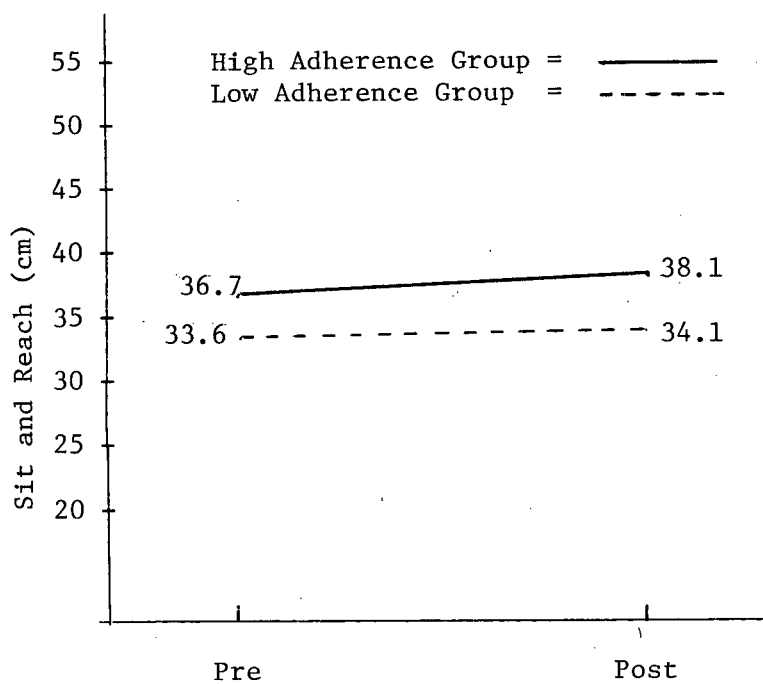


Figure 11. Sit and Reach

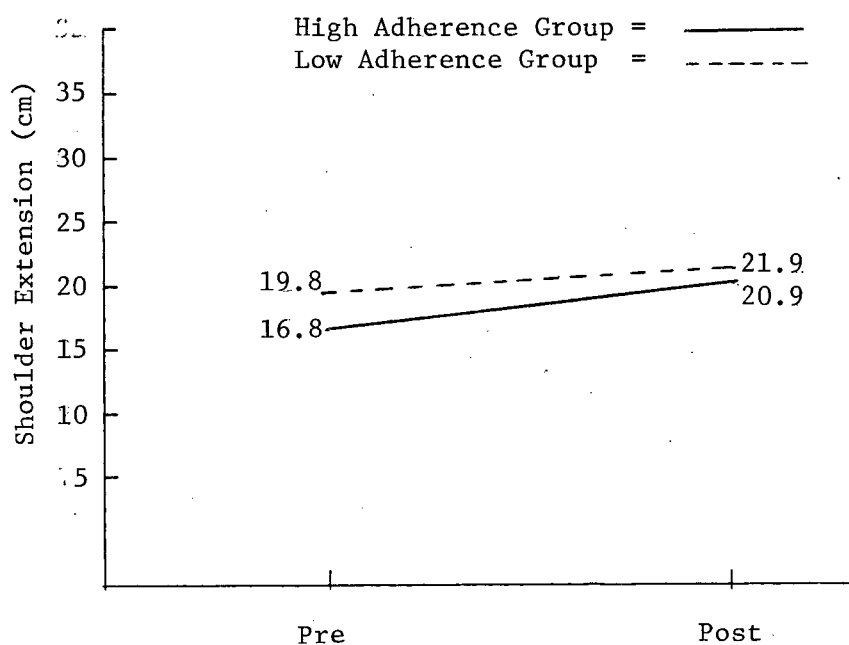


Figure 12. Shoulder Extension

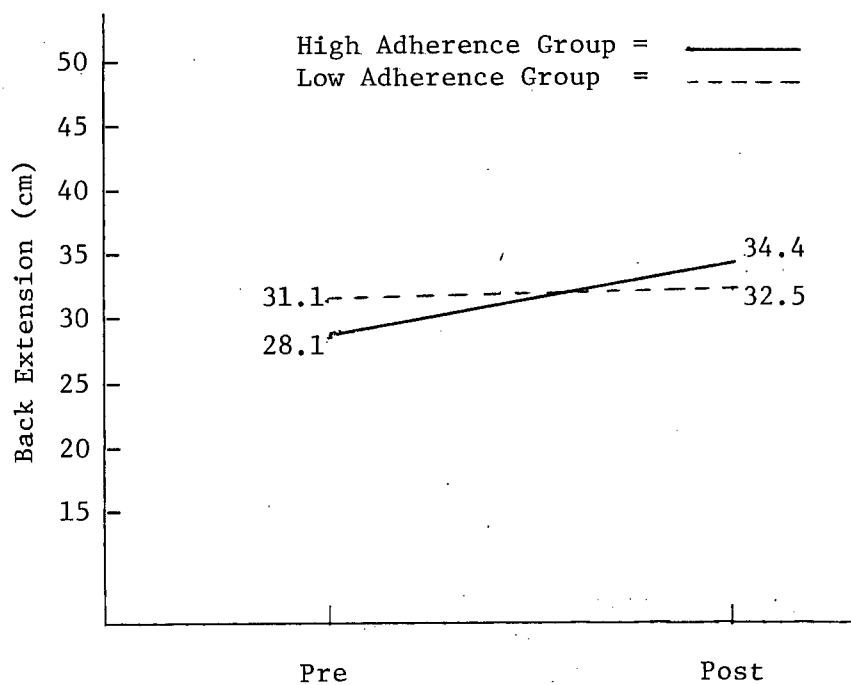


Figure 13. Back Extension

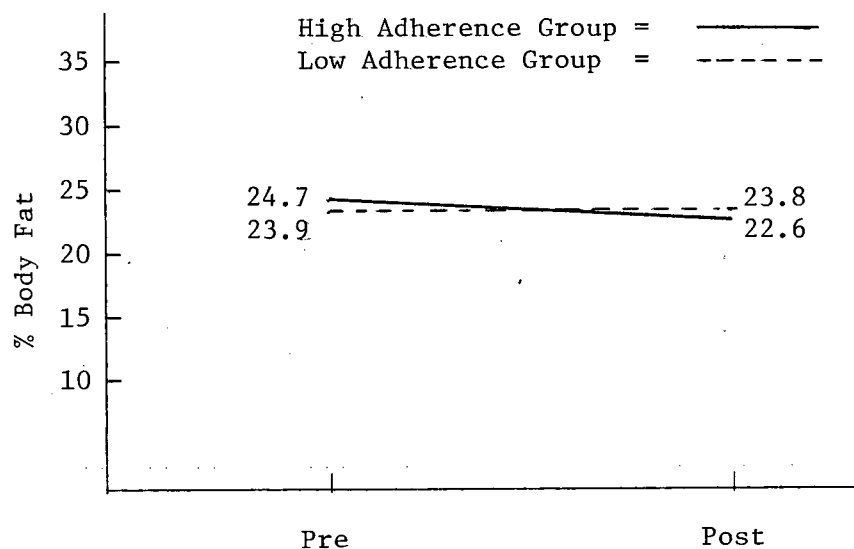


Figure 14. % Body Fat

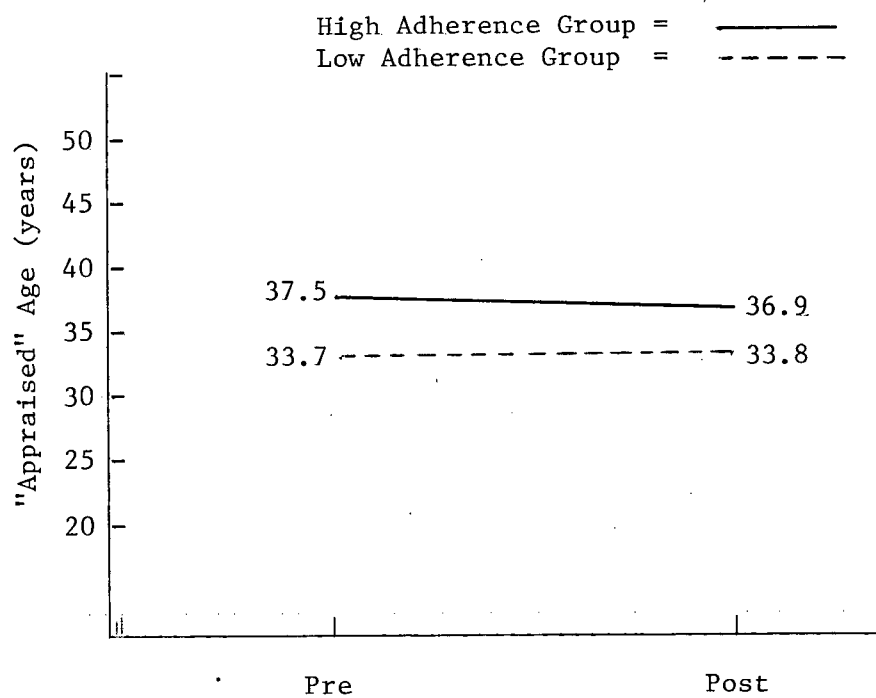


Figure 15. "Appraised" Age

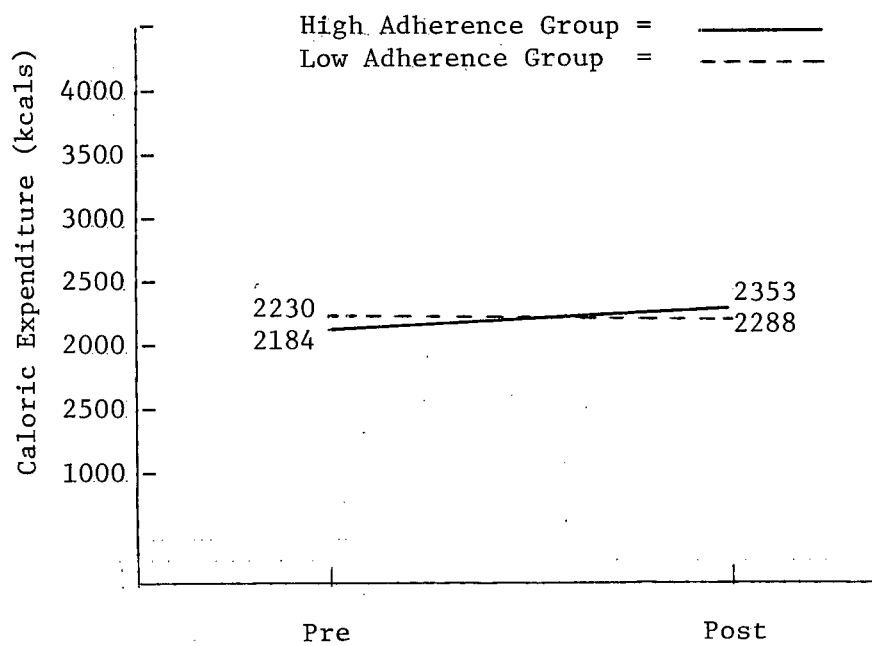


Figure 16. Caloric Expenditure

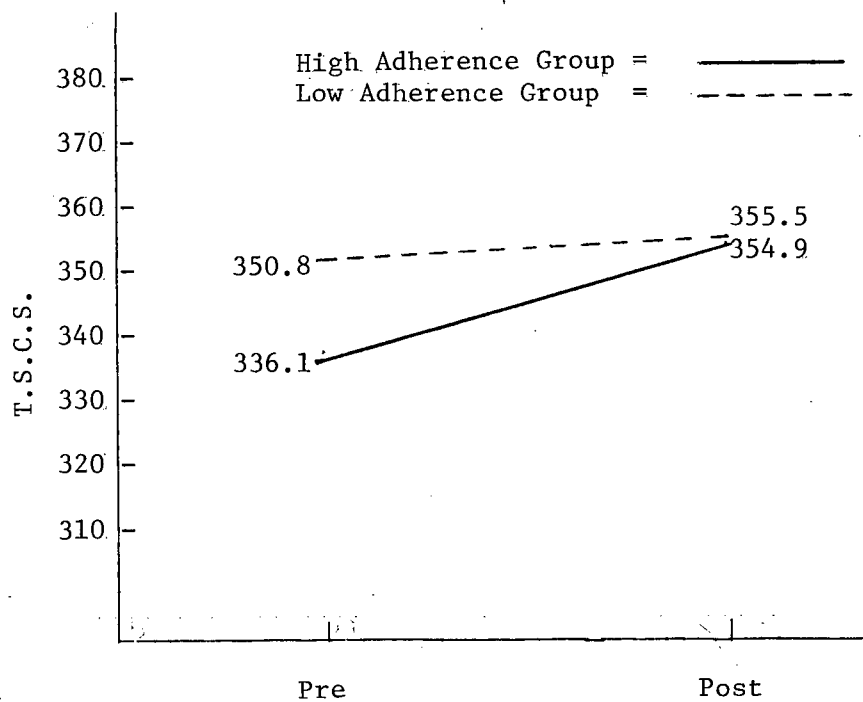


Figure 17. Tennessee Self Concept Score

Table 6

Observed Cell Means For High vs. Low Adherence Participants

Dependent Variable	High Adherence		Low Adherence	
	Pre (S.D.)	Post (S.D.)	Pre (S.D.)	Post (S.D.)
Préd. MVO ₂ (ml/kg/min)	27.2 (4.4)	29.6 (4.1)	25.6 (4.3)	26.0 (3.7)
Sit/Reach (cm)	36.7 (5.3)	38.1 (4.7)	33.6 (6.8)	34.1 (7.2)
Shoulder Extension (cm)	16.8 (5.0)	20.9 (7.9)	19.8 (10.9)	21.9 (11.1)
Back Extension (cm)	28.1 (9.1)	34.4 (10.2)	31.1 (10.6)	32.5 (12.5)
Body Fat (%)	24.7 (6.6)	22.6 (4.7)	23.9 (4.9)	23.8 (4.8)
"Appraised" Age (years)	37.5 (10.3)	36.9 (9.2)	33.7 (13.2)	33.8 (13.2)
Caloric Expenditure (kcal)	2184.5 (287.3)	2353.6 (210.0)	2230.7 (356.6)	2288.4 (321.0)
T.S.C.S.* *(n=21)	336.1 (29.5)	354.9 (39.2)	350.8 (27.7)	355.5 (36.6)
	(n = 8)		(n = 13)	

Based on the above results and having regard for the problems associated with some of the statistical analyses it seems reasonable to propose that Hypothesis 3 as stated in Chapter 1 should be accepted with reservations.

Discussion of the Employee Fitness Pilot Program Results

A major assumption of this study was that an employee fitness program would result in a significant increase in the physical activity and physical fitness of the participants thereby increasing their self concept and decreasing lifestyle risk factors. Hypothesis 1 was upheld, but not uniformly on all levels.

Analysis of the data indicates statistically significant changes in both the levels of physical activity and physical fitness of the employees. These results are in agreement with regard to the direction but not to the extent of improvements noted in other studies of this type and duration (Yuhasz 1977, 1978). Perhaps this can be explained by the higher attendance of the participants at the lunch hour exercise classes which were designed primarily as a mid-day exercise break. The more vigorous aerobic program offered after work was not as well attended. A number of other researchers have reported improvements in functional physical fitness parameters in a variety of employee fitness programs (Peepre, 1978; Fogle, 1975; Kœrner, 1973; Garson, 1977; Yarovote, 1974; Heinzelman, 1974; Durbeck, 1972).

The groups showed no numerical change in the mean "appraised" age and the change in the self concept mean score was not statistically significant.

The T.S.C.S. results agree with those published by Williams (1973) who found that the involvement of subjects in a program of physical education, fitness and skill acquisition had no significant effect on self concept. However, a number of researchers has found notable changes in self concept over the course of physical development programs.

Self concept is made up of many areas. These areas include physical ability, mental ability, social relations, attractive appearance, work habits and social values, with each area differing in importance or reward value from the others (Black, 1976). Perhaps the reward value of increased physical activity and fitness was not sufficient for the subjects in this study to significantly increase the mean self concept. It would appear that although an attempt was made to relate changes in physical fitness to self concept, this was not accomplished during the twelve week period for the twenty-one employees who responded to the questionnaire. The relatively poor return of the T.S.C.S. questionnaires would also seem to indicate that this instrument is unsuitable for this particular sample and experimental design. Although confidentiality was assured, a number of subjects refused to comply with the request to fill in the pertinent questionnaire forms.

The Health Hazard Appraisals showed the mean "actual" age for the subjects was 35.3 years compared to the "appraised" age of 34.8 years and 34.7 years for the pre and post tests respectively. The "appraised" ages in both cases indicate a mean net risk reduction of .5 and .6 years. The H.H.A. was used in this study to advocate certain lifestyle changes to the employees in order to improve the length and quality of life. The initial H.H.A. score indicated a small degree of reduction of lifestyle risk factors. Perhaps this is related to the occupational nature of the sample, i.e. health care professionals and support staff. Nevertheless, examination of the

pretest H.H.A. data reveals that a mean net risk reduction (the "achievable" age) of 2.4 years was possible had the employees complied fully with the recommended modifications of their lifestyle.

Table 7
Health Hazard Appraisal
(Pretest Mean Ages)

Actual Age	Appraised Age	Achievable Age
35.3	34.8	32.9

The information presented in Table 7 shows that the subjects did not fully comply with the recommended lifestyle modifications during the pilot period.

Discussion of the Program Components and Adherence Results

These results pertain to the main problem investigated in this study i.e. to determine which of several selected combinations of components within an employee fitness program could positively affect female hospital workers rate of adherence to a regular physical activity routine. To recapitulate, the specific program components studied were:

- a) a lifestyle and fitness assessment and retest (Groups 1, 2 3)
- b) an on-site exercise facility with scheduled exercise classes
(Groups 1 and 2)
- c) an education and motivation program (Groups 1 and 3).

Thus, the different combinations of motivational and practical factors were introduced into the workplace with the intention of determining (a) if the maximal stimulus program (Group 1) was indeed better than any lesser combinations in producing a higher rate of adherence to the employee fitness program and (b) if the maximal stimulus program produced the highest improvements in the measured dependent variables. Essentially, Group 1 had the advantage of a "total" program compared to Group 2 with the "exercise" program and Group 3 with the "education" program.

Based on this review of pertinent literature and professional experience with a variety of employee fitness programs, the investigator believed that it was necessary to include all three program components when implementing an employee fitness program in order to obtain a higher rate of adherence by the program participants. This "maximal stimulus" approach would obtain a higher rate of adherence than if there were fewer modes of stimulus provided. Peepre (1978) has reported that a highly integrated fitness and health promotion program should combine fitness and lifestyle awareness components in order to stimulate high participation rates. It was, therefore, hypothesized that employees in Group 1 would achieve a higher rate of adherence to a regular exercise routine with greater changes in the dependent variables than Groups 2 and 3.

The results, however, indicate that this effect was not achieved in this study. The results from the Chi-square test of independence indicate no significant difference between the groups.

In this study, the highest percentage of high adherence participants belonged to Group 2, the "exercise" program, with 38.5% of the participants demonstrating a high level of adherence to a regular exercise routine i.e. participating three or more times a week. This was followed by Group 1 participants (33.3%), who had the "advantage" of the "total" or maximal stimulus program. Only 15.4% of the Group 3 participants demonstrated high adherence participation.

The groups by tests interactions of the ANOVA's used in this study were employed in statistically validating the hypothesized adherence differences between the groups. As could be expected, perusal of the adherence data shows that Group 1 participants did not demonstrate a significantly greater change in the measured dependent variables when compared with Groups 2 and 3.

Although the majority of participants cited the professional quality of the programs offered, a high number of subjects reported to the investigator that time constraints, both at work and at home, resulted in a lower participation rate that they initially expected. This appears to have been the main factor which resulted in the relatively low percentage of high adherence participants in all three groups. Thirty of the final thirty-eight subjects were married and the majority of these subjects had families. Essentially, these employees were engaged both as hospital workers and homemakers. Accordingly, many of the participants expressed to the investigator that they had no time to attend the various classes offered after work, or to work out on their own at home.

During the pilot program budget cuts by the B.C. Ministry of Health resulted in cutbacks and layoffs in hospitals throughout the province. Many of the employees in the Peace Arch program felt that increased workloads and responsibilities did not allow them enough time to participate in the exercise classes offered during the work day. Although the original plan of the pilot program did allow the various department directors to schedule flexible working hours on an individual basis to facilitate participation in the classes, many of the employees felt that the situation was not conducive to taking the extra time off and thus, did not take advantage of the situation.

Perhaps the main factor which detracted from the total effect of all three program components on the adherence rate of Group 1 participants was the time commitment to the "total" program. Many of the Group 1 "low adherers" indicated to the investigator that they did not have enough "time" to participate in a regular exercise routine at least three times a week. Many of these employees believed that the "total" program interfered too much with their daily work routine and were unwilling to make the necessary adjustments to their daily schedules. This concurs with results published by Wanzel and Danielson (1977) who found that the necessary rearrangement of a participant's daily schedule to accommodate exercise sessions was a major reason for withdrawal from a company fitness program. Respondents to their research questionnaire indicated that the availability of exercise classes during office hours would have been a suitable alternative to their

after-hours exercise periods and would have kept them in the program. 78% of their respondents felt that this type of scheduling would not have decreased their normal office productivity. The investigators recommended that employers should investigate the possibility of adjusting individual work schedules to incorporate the workout periods of interested employees thus reducing the strain of fitness participation on an employee's daily schedule.

The results from this study indicate that such a strategy seems necessary to positively influence the adherence rate of the Peace Arch Hospital employees to regular exercise. The classes were held during the lunch breaks and after work which can be considered "non-job" hours. Although paramount importance was placed on the factors which influence exercise program adherence when the program was designed, it seems likely that the availability of exercise and education classes with established time off normal working hours could greatly influence program participation by the employees in all three groups and increase the rate of adherence to a regular exercise routine.

Discussion of High vs. Low Adherence Results

Hypothesis 3 stated that high adherence participants in all three groups would show a significantly greater change in the measured dependent variables when compared with the low adherence participants. The majority of the low adherence participants were involved in a regular physical activity routine one or less times per week. Due to large differences among the cell variances in five of the eight dependent variables, these were considered inappropriate for statistical analyses.

The three variables that were analysed revealed significant differences between high and low adherence participants with respect to improvement over the pilot period i.e. the high adherence participants improved significantly more than the low adherence participants. The five dependent variables inappropriate for the statistical analyses also revealed this trend, thus permitting an acceptance of Hypothesis 3 with reservations. The decision to accept Hypothesis 3 with reservations is consistent with studies on employee fitness programs reviewed in Chapter 2. These studies have reported a positive and consistent relationship between program effects and program adherence (Heinzelman and Durbeck, 1970; Yarovote et al., 1974; Fogle and Verdesca, 1975; Yuhasz, 1977, 1978; Koerner, 1973; Peepre, 1979).

The high adherence participants (those who were involved in a regular physical activity program at least three times a week) accounted for approximately 30% of the sample. This figure is approximately similar to at least two other studies of employee fitness programs (Heinzelman, 1970; Fogle, 1975) where high adherence participation by 35% of their respective samples were reported.

High adherence figures from other programs vary from 11% (Yarovote, 1974) to 78% (Yuhasz, 1978) of the participants. A number of these programs, however, have considered high adherence or regular attendance based on a participation rate of at least twice a week. Based on the existing evidence concerning the effect of difference exercise prescriptions on healthy adults, the American College of Sports Medicine (1978) has recommended the frequency of training to be 3 to 5 days per week.

Chapter 5

SUMMARY AND CONCLUSIONS

Summary

Stimulating participants' to a high level of adherence to supervised or unsupervised exercise routines has been a major problem for many employee fitness programs in North America. A number of factors which influence the initiation of and adherence to exercise programs by adults has been reported. Much of the data available on factors important for adherence to exercise programs has been obtained from asking participants or dropouts about program characteristics that influence their participation and not from controlled trials where selected program characteristics are systematically varied and their effects evaluated.

The purpose of this investigation was to determine if several selected components in combination, within an employee fitness program, could positively affect female hospital workers' rate of adherence to a regular physical activity routine. The specific program components studied were:

- a) a lifestyle and fitness assessment and retest
- b) an on-site exercise facility with scheduled exercise classes
- c) an education and motivation program.

The subjects were randomly assigned to one of three groups. Each group participated in a lifestyle and fitness assessment but was otherwise distinguished as follows: Group 1 was assigned to the exercise facility, exercise classes and the education and motivation program. Group 2 was assigned to the exercise facility and exercise classes. Group 3 was assigned to the education and motivation program.

An attempt was made to determine if the maximal stimulus program available to Group 1 resulted in (i) a superior rate of adherence to a regular exercise routine and (ii) a greater improvement in the dependent variables, compared with Groups 2 and 3.

Two additional hypotheses were examined in the study. The first hypothesis dealt with a basic theme underlying the investigation: to study the effects of the employee fitness pilot program on the physical fitness, physical activity, lifestyle risk factors and self concept of the employee sample.

The third hypothesis examined the relationship between adherence (high or low) and the amount of change in the measured dependent variables from the pre to post tests.

The Employee Fitness Program was conducted over a twelve week period and the subjects were pretested and posttested for:

1. physical activity as evaluated by the three day Action B.C. Nutrition Evaluation.

2. physical fitness as evaluated by the Dynavit bicycle ergometer (Dynavit, 1978), flexibility (Sinclair and Rhodes, 1977) and percent body fat (Kuntzelman, 1975).
3. self concept as evaluated by the Tennessee Self Concept Scale (Fitts, 1956).
4. lifestyle risk factors as evaluated by the Health Hazard Appraisal (Hsu and Milson, 1977).

An analysis of variance program was used to ascertain any differences that occurred in the measured dependent variables over the course of the program and between the groups. The Chi-square test of independence was used to ascertain any differences in the adherence rate between the groups. Complete data was obtained for 38 subjects: 12 in Group 1 and 13 in both Groups 2 and 3. These were remaining after 12 subjects were dropped for non-compliance with the requirement for completing the retest due to a variety of reasons. The study used a 3 X 2 factorial design with repeated measures on the second factor for Hypotheses 1 and 2. The independent variables were the treatment factor with three levels (Group 1, Group 2, Group 3) and the time factor with two levels (Pre, Post). The experimental design employed for Hypothesis 3 was a 2 X 2 factorial design with repeated measures on the last factor. In this case, the independent variables were the treatment factor with two levels (High vs. Low Adherence groups) and the time factor with two levels (Pre, Post). Eight dependent variables

were measured: predicted oxygen uptake, sit and reach, shoulder extension, back extension, percent body fat, caloric expenditure, "appraised" age and self concept.

Results

A basic theme underlying this investigation was that of studying the effects of the twelve week employee fitness pilot program on the physical fitness, physical activity, lifestyle risk factors and self concept of the employees. Statistical analyses of the data indicated the following results regarding Hypothesis 1:

- a) a significant increase in the caloric expenditure ($p = .017$) measured to assess the physical activity of the subjects
- b) a significant increase in the oxygen uptake ($p = .006$) measured to assess physical fitness
- c) a significant increase in shoulder extension ($p = .012$) and back extension ($p = .015$) measured to assess physical fitness
- d) a significant decrease in percent body fat ($p = .047$) measured to assess physical fitness.

Positive changes not considered significant were found in the sit and reach ($p = .101$) and the Tennessee Self Concept scores ($p = .066$).

The decrease in the "appraised" age was not considered significant ($p = .617$). Thus, the results support the hypothesized improvements dealing with physical activity levels and physical fitness. The hypothesized improvements dealing with lifestyle risk factors and self concept, however, were not substantiated.

Hypothesis 2, the main problem of the investigation, dealt with the relationship between the combinations of selected program components and adherence. An attempt was made to show the total effect of an educational program together with the availability of a fitness facility and exercise opportunities on the adherence rate of an employee fitness program. The Chi-square test of independence revealed no significant difference among the three groups in adherence ($p = .03971$). The G X T interactions contained in the ANOVA's validated the Chi-square results by showing no significant differences among the groups for the hypothesized improvements in the dependent variables.

Hypothesis 3 of the investigation was concerned with the relationship between adherence (high or low) and the amount of change in the measured dependent variables from the pre to post tests. Employees were categorized as either high adherence participants ($n = 11$) or low adherence participants ($n = 27$), based on data in self reported progress charts. Unfortunately, due to the unequal numbers in the groups and the large differences between cell variances, five of the dependent variables (sit and reach, shoulder extension, "appraised" age, caloric expenditure and Tennessee Self Concept score) were considered inappropriate for statistical analyses. For the remaining three variables analysed, there existed a significant relationship between adherence and the amount of improvement i.e. the high adherence participants showed a significant improvement over the low adherence participants. The G X T interactions calculated in the ANOVA's revealed significant F values

for the (a) predicted oxygen uptake ($p = .003$), (b) back extension ($p = .037$) and (c) percent body fat ($p = .006$). This trend was also noted in the five variables that were inappropriate for statistical analyses.

Conclusions

Within the limitations and delimitations of the sample population, experimental procedures used and statistical analyses performed, the following conclusions appear justified:

1. As a group, the participants in the employee fitness program showed a significant increase in their daily physical activity and a significant improvement in their physical fitness.
2. As a group, the participants in the employee fitness program did not significantly decrease lifestyle risk factors.
3. As a group, the participants in the employee fitness program did not show a significant increase in their self concept.
4. There were no significant differences between the three groups in adherence rates, thus indicating that for one group, the combination of three components designed to stimulate a high level of adherence succeeded no better in doing this than the combinations of two components for the other two groups.
5. There were no significant differences between the three groups in hypothesized improvements in the dependent variables.
6. High adherence participants demonstrated significantly greater changes in three of the measured dependent variables when compared to low adherence participants. This trend was also noticed in the five variables inappropriate for statistical analyses.

Recommendations

1. Stimulating high adherence to an employee fitness program in hospitals or similar work environments, where employees are often subjected to stressful situations and strenuous routines, seems to offer particular difficulties when participation is required during the employee's free time. A study similar to this should be done with paid release time for exercise and lifestyle educational sessions in order to determine the effects on adherence rates, physical activity, fitness improvements, lifestyle modifications and self concept.
2. Investigators undertaking research related to adherence to exercise programs should use a standard reference value for "high" and "low" adherence. This should bring coherence to comparisons of studies of this kind, which is always desirable for scientific reasons. The American College of Sports Medicine (1978) standards regarding frequency, intensity and duration of exercise appear to be reasonable guidelines for this purpose.
3. A further study to examine the effects of the specific program components used in this study to determine their effectiveness in the initiation and maintenance of regular physical activity routines would seem worth doing. The various combinations of components in this study made it difficult to assess the effectiveness of any particular component.

4. To improve this study, the various combinations of program components could be tested at different hospitals. This would hopefully result in a more controlled study with a larger number of subjects per group. This procedure was unfortunately beyond the scope of the present study.
5. As absenteeism is an important human resource problem faced by employers, it would seem worthwhile to compare absentee records with attendance records to a company sponsored employee fitness program in subsequent studies.

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APPENDICES

APPENDIX 1

P.A.D.H. EMPLOYEE FITNESS PROGRAM PROPOSAL

PEACE ARCH HOSPITAL
EMPLOYEE HEALTH AND FITNESS
PROGRAM PROPOSAL

February 1979

INDEX

1. INTRODUCTION
2. OBJECTIVES OF THE PROGRAM
3. PROGRAM DESIGN
4. RESEARCH COMPONENT
5. PROGRAM RECOMMENDATIONS AND EXPANSION
6. REFERENCES
7. APPENDIX

1. INTRODUCTION

Action B.C. believes that physical fitness and improved health habits can make an important contribution to the overall function of the employee in the work setting. With the growing interest in preventive medicine, exercise programs have become increasingly important. Exercise is practical, inexpensive and can prove effective against various health problems including lower back pain and coronary heart disease.

Results claimed by companies who have programs available to employees include:

- a) Improved employee health
 - reduced incidence of cardiovascular illness and death among employees
 - reduced absenteeism
- b) Improved morale
- c) Improved productivity
- d) A decrease in the financial burden of replacing top level personnel who have incurred some sort of hypokinetic illness^{1,2}

Heart disease alone represents thousands of lost working years to the Canadian employer. The cost of compensation to employers showed a national increase of 72% in the ten year period between 1965 and 1974³.

A recently completed report in Ontario titled "The Relationship between Physical Fitness and the Cost of Health Care", concluded:

- a) People with higher levels of physical fitness tend to have lower Ontario Health Insurance Plan (O.H.I.P.) medical claims
- b) An estimated reduction of \$31 million in O.H.I.P. medical claims could be expected if all adults age 20-69 years were of at least average level of physical fitness
- c) People with higher levels of physical fitness tend to have reduced incidence of coronary heart disease⁴

Physicians and public health authorities stress prevention more than ever before. As health costs mount, prevention proves to be the only affordable course of action. The lifestyle of an individual has been defined as "the aggregation of decisions by individuals which affect their health and over which they more or less have control"⁵. Lifestyle changes which could improve the health and quality of life for most Canadians include:

- proper exercise
- sound nutrition
- reduced weight
- reduced alcohol and tobacco consumption

The Peace Arch Hospital Employee Health and Fitness Program will offer the opportunity for lifestyle enhancement to employees interested in a positive change of lifestyle based on individual testing and counselling.

2. OBJECTIVES OF THE PROGRAM

The main objective is to promote a healthier and more positive lifestyle of the employees at Peace Arch Hospital. A reduction in lifestyle risk factors associated with today's sedentary society is also expected.

These objectives are hoped to be met by providing the employees with a comprehensive schedule of physical fitness classes and educational films and lectures.

The research component of the program will attempt to determine modifications of lifestyle as reflected by the following measured criteria:

- physical fitness
- lifestyle analysis
- nutrition evaluation
- psycho-social attitudes

3. PROGRAM DESIGN

The program design will consist of two major components:

- a) the fitness classes, and
- b) the motivation and education program.

The schedule of fitness classes will be flexible to accommodate the fitness levels of the employees and the number of varying shifts within the hospital. The employees will be encouraged

to use the hospital exercise room at their convenience. The fitness classes will stress the three main components of physical fitness:

- a) Cardiovascular Fitness
- b) Muscular Endurance
- c) Flexibility

The fitness schedule will be drawn up according to the principles of exercise as well as the employee's current fitness levels so that attendance at a fitness class will prove to be enjoyable and somewhat challenging.

A group of individuals from within the hospital ranks will lead the fitness classes. A fitness leader's training program was completed by all the group leaders and provided them with some of the theoretical information and practical background necessary to produce an effective fitness experience.

The motivation and education program will include an ongoing schedule of films and guest speakers dealing with topics on positive health developments and lifestyle changes. This schedule will be available in the near future. The purpose of this program is to acquaint the group with the benefits of physical activity and lifestyle modification. It is hoped that this educational component will enhance the adherence rates of the employees to the program.

Pamphlets, booklets and texts on physical fitness, nutrition, smoking cessation etc., will be available to the hospital staff through the Employee Health and Fitness Library (Appendix 1).

4. RESEARCH COMPONENT

Prior to the implementation of the program, Action B.C. staff will administer a functional physical fitness assessment (Appendix 2), a lifestyle analysis (Appendix 3), and a nutritional evaluation (Appendix 4), to each participant in the program. Certain inventories will be chosen and administered to ascertain specific psycho-social attitudes relevant to the program. These inventories, when selected, will attempt to ascertain attitudes towards physical activity, job satisfaction and self image.

The research design is still under consideration, however information will be available in the near future specifying details of the design. At the time of the testing session, exercise recommendations will be administered on an individual basis in accordance with the needs, ability, and interests of each employee. Further counselling will be based on the interpretation of the lifestyle risk inventory and the nutrition evaluation.

At the end of twelve weeks, post tests will be administered to determine any changes in fitness levels, lifestyle risk factors and psycho-social attitudes.

5. PROGRAM RECOMMENDATIONS AND EXPANSION

Based on the data from the research component, recommendations concerning program modifications will be made. If the initial

program proves successful, expansion will occur according to the demands and interests of the employees of Peace Arch Hospital.

This task will primarily be the responsibility of the Peace Arch Hospital Fitness Committee and the Fitness Leaders. A fitness consultant from Action B.C. will be available to the hospital on a request basis as a resource person.

APPENDIX 2

LIFESTYLE AND FITNESS ASSESSMENT MATERIALS

ACTION B.C.

LIFESTYLE & FITNESS ASSESSMENT

Action B.C.'s introduction to Lifestyle Modification and Fitness Assessment program begins with a motivational film. After the film, a general discussion about alternative lifestyles are introduced. An explanation followed by demonstration of physical assessment techniques are presented and possible follow-up activities were outlined.

Upon confirmation of date, time and schedule of participating individuals, Action B.C. provides the following services:

1. Health Hazard Appraisal


The computerized printout provides personal information. The analysis compares risks imposed upon a person's lifestyle and how they compare to others their own age and sex. More positively, it provides recommendations for desirable lifestyles and healthy living habits. The interpretation of the program is provided by a specially trained counsellor.

2. Nutrition Evaluation

This analysis is also computerized and it's results are linked with the Lifestyle Analysis. This part of the program considers the individual's energy requirements and energy expenditures for each day recorded. We recommend a three day analysis. The personalized print-out breaks down the food and drink consumed for three days into: caloric intake, amount from each food group, percentage of fat, carbohydrate and protein consumed, vitamin and mineral intake and it will offer requirements for the individual based on his/her age and sex. A specially trained counsellor interprets the results.

3. Fitness Assessment

Action B.C.'s specially designed assessment evaluates an individual's body composition, flexibility and cardiorespiratory fitness level.



a. Body Composition

The body composition test measures an individual's percentage of body fat. Using fat calipers, skin fold measurements are taken to get the results.

b. Flexibility

Flexibility tests measure an individual's ability to move the joints through a normal range of motion. Three areas are focused on: hip, shoulder and back.

c. Cardiorespiratory Assessment

A fitness specialist can determine an individual's endurance capacity, physical work capacity (P.W.C.), caloric expenditures during exercise and recommended exercise load for maintaining a good state of health. The Dynavit bicycle ergometer is used for this assessment.

ACTION B.C.

LIFESTYLE AND FITNESS ASSESSMENT PROGRAMAPPOINTMENT SCHEDULE

Included with this appointment sheet is a PAR-Q questionnaire. The PAR-Q is a screening technique used to identify the individuals who should consult a physician before participating in a cardio-respiratory test such as the one done by Action B.C. on the bicycle. Please be certain every person who is to participate reads the questionnaire! We have included the PAR-Q to assist you in determining the individuals who should not have a cardio-respiratory test. In this way we can avoid disappointing anyone on the day of the test. Below you will find a list of the do's and don'ts for your group to follow prior to the testing procedure.

DO'S AND DON'TS

1. Do wear loose clothes (separating at the waist - some participants may wish to wear a T-shirt for the test).
2. Do avoid smoking for one hour before the test.
3. Do avoid eating a big meal or drinking coffee, tea or alcohol two hours before the test.
4. Do not exercise on the day of your test.
5. Don't worry. A fitness test can be fun! Our staff is there to answer any questions and to help whenever necessary.

INSTRUCTIONS

1. Please make sure you fill out the following forms:
 - a) Health Hazard Appraisal
 - b) 3-Day Nutrition Analysis
 - c) Tennessee Self-Concept Questionnaire
 - d) Peace Arch Hospital Fitness Program Questionnaire
2. READ THE INSTRUCTIONS before filling out the forms. This is particularly essential when recording information on the health hazard appraisal and the nutrition analysis. The computer cannot analyse forms which are filled out incorrectly. Make haste slowly!
3. Please bring all completed forms with you to the fitness assessment.
4. The Peace Arch Fitness Program Questionnaire and the Tennessee self-concept scale are necessary tools for the research component of the physical fitness program. All results will be confidential and general conclusions only will be drawn from the data. Please make a special effort to fill out these forms.
5. Please be on time for your appointment. If possible, wear loose clothing and running shoes.
6. Avoid smoking for one hour before the test and avoid eating a big meal, drinking coffee, tea or alcohol for two hours before the test.
7. Don't exercise on the day of your test.
8. Relax - As many of you found out twelve weeks ago, a fitness test can be fun!

APPENDIX 3
EMPLOYEE FITNESS PROGRAM SCHEDULE
AND FITNESS LEADERS SCHEDULE

P.A.D.H. EMPLOYEE FITNESS PROGRAM

CLASS SCHEDULE

March 12 to June 1, 1979

	Monday	Tuesday	Wednesday	Thursday	Friday
11:30	Start Fit (Session 1)	Start Fit (Session 1)		Start Fit (Session 1)	
12:00	Start Fit (Session 2)	Start Fit (Session 2)		Start Fit (Session 2)	
1:00					
1:30	Free	Free		Free	
2:00	Exercise	Exercise		Exercise	
2:30	Time ↓	Time ↓		Time ↓	
3:00					
3:30					
4:00					
4:30	Keep Fit and Walk-Jog	Keep Fit and Walk-Jog		Keep Fit and Walk-Jog	
5:00					

FITNESS LEADERS' SCHEDULE

April 1979

1. Start Fit Lunch Break

Monday:	11:30 - 12:00	Julie
	12:00 - 12:30	Bette
	12:30 - 1:00	Ruth
Tuesday:	11:30 - 12:00	Bette
	12:00 - 12:30	Valerie
	12:30 - 1:00	Al
Thursday:	11:30 - 12:00	Jeanette
	12:00 - 12:30	Julie
	12:30 - 1:00	Al

2. Keep Fit

Monday:	4:15 - 4:55	Jacquie
Tuesday:	4:15 - 4:55	Jacquie
Thursday:	4:15 - 4:55	Jacquie

3. Walk/Jog Program

Monday:	4:15 - 4:55	John
Tuesday:	4:15 - 4:55	John
Thursday	4:15 - 4:55	John and/or Jeanette

APPENDIX 4

LIFESTYLE EDUCATION AND MOTIVATION PROGRAM

LIFESTYLE EDUCATION PROGRAM SCHEDULEMARCH

1. FILM: "THE GOOD LIFE" (sound-color) ...

A PARTICIPATION FILM which humorously points out that today's good life is not necessarily a healthy life. Increased physical activity is emphasized (attendance: 30 persons).

2. FILM: "IT HAPPENED TO ME" (sound-color)

This film is designed to provoke action by the audience so that it will A) accept responsibility for health maintenance, B) change living habits to reduce risk of cardiovascular disease and C) to help others to do likewise (attendance: 17 persons).

3. FILM: "HEART ATTACK? COUNTERATTACK!" (sound-color)

A MOTIVATIONAL FILM presented by Dr. T. Kavanagh, Medical Director of the Toronto Rehabilitation Centre. It shows the medically supervised fitness program that is held at the Centre for Cardiac Patients, and also gives new confidence that the risk of heart disease can be avoided by an active lifestyle (attendance: 22 persons).

APRIL1. FILM: "PHYSICAL FITNESS - THE NEW PERSPECTIVE" (sound-color)

This light hearted animated film takes a serious look at the effects of urban lifestyle on physical fitness. A rural family, displaced from their farm by the advance of mechanization, move to the city where their physical condition visibly deteriorates. The positive aspects of being physically fit are emphasized and many simple ways to increase everyday activity are introduced (attendance: 12 persons).

2. FILM: "WEIGHT CONTROL: JUST A STEP AWAY" (sound-color)

This film demonstrates the value of activity in weight reduction and control (attendance: 30 persons).

3. WORKSHOP: "PREVENTION OF RUNNING INJURIES"

This workshop focused on the biomechanical principles behind running and jogging, preventive measures to avoid injury and the characteristics of a good jogging shoe (attendance: 6 persons).

SPEAKER: Mike MacLeod, Action B.C. Fitness Consultant

4. FILM: "COPING WITH LIFE ON THE RUN" (sound-color)

An extremely motivational film which discusses the physical, psychological and emotional rewards of physical activity through running. This film is narrated by Dr. George Sheehan, one of the leading proponents of exercise and preventive medicine in the U.S. (attendance: 24 persons).

MAY1. FILM: "STRESS" (sound-color)

This program examines the concepts of stress in conjunction with a variety of people and lifestyles. Based on the findings of Dr. Hans Selye, it is explained that a certain degree of stress is both necessary and desirable for physical and mental well-being. However, if stress is prolonged, illness can result. "stress with distress" is emphasized (attendance: 13 persons).

2. WORKSHOP: "RELAXATION TRAINING"

This workshop focused on learning the relaxation response as a method of stress and tension reduction. The participants were guided through a process designed to reduce the level of nervous stimuli from tense skeletal muscles to the brain and in so doing, quieten the total self (attendance: 10 persons).

SPEAKER: Dr. Hugh Venables, Action B.C., Technical Director

3. WORKSHOP: "BODY AWARENESS AND RELAXATION"

This workshop examined the "Feldenkrais Method" of body awareness and its incorporation into relaxation achievement (attendance: 12 persons).

SPEAKER: Dr. S. Brown, Dept. of Physical Education, U.B.C.

4. FILM/WORKSHOP: "IS IT WORTH YOUR LIFE" (sound-color)

A film which documents the harmful effects of smoking on the human body. A smoking cessation consultant was also available for those interested in quitting the smoking habit (attendance: 7 persons).

CONSULTANT: Marie Tracey, Action B.C., Smoking Cessation Program

APPENDIX 5
BIBLIOGRAPHY OF HEALTH EDUCATION LITERATURE
AND "FITNESS MEMOS"

EMPLOYEE HEALTH AND FITNESS LIBRARY

BOOKS

AUTHORS

- | | |
|--|------------------------------------|
| 1. The New Aerobics | K.H. Cooper M.D. |
| 2. The Aerobics Way | K.H. Cooper M.D. |
| 3. Activetics | C.T. Kuntzelman Ph.D. |
| 4. Jogging - A Physical Fitness Program for all Ages | W.J. Bowerman |
| 5. The Joy of Running | T. Kostrubala M.D. |
| 6. The Complete Book of Running | J.F. Fixx |
| 7. Women's Running | J. Ulliyot M.D. |
| 8. The Complete Diet Guide | Editors of Runner's World Magazine |
| 9. Beginner's Running Guide | Hal Higdon |
| 10. Encyclopedia of Athletic Injuries | G. Sheehan M.D. |

PAMPHLETS AND BOOKLETS

1. Health and Fitness. P.O. Astrand.(Recreation Canada)
2. Heart Attack, How to Reduce Your Risk. (B.C. Heart Foundation)
3. Physical Activity and Your Heart. (B.C. Heart Foundation)
4. Participate, Do It Your Way. (Participaction)
5. Family Fitness. (Fleischmann's)
6. Your Heart: What Smoking May Do. (B.C. Heart Foundation)
7. Recipes for Fat Controlled, Low Cholesterol Meals. (B.C. Heart Foundation)

8. Cigarettes and Your Health. (B.C. Ministry of Health)
9. Your Choice - Nutrition in Pregnancy. (B.C. Health Dept.)
10. Food and Your Heart. (Health and Welfare Canada)
11. The Joy of Eating: A Guide to Better Nutrition. (Mutual Life of Canada)
12. Walking and Hiking. (Sun Life of Canada)
13. Rowing and Paddling. (Sun Life of Canada)
14. The Fitness Wheel. (Canadian Heart Foundation)
15. A Sane Look at Cancer. (Canadian Cancer Society)
16. The Pap Test - "It only takes Minutes to be Sure". (Canadian Cancer Society)
17. Breast Cancer. (Canadian Cancer Society)
18. When a Woman Smokes. (Canadian Cancer Society)
19. Cancer Facts for Men. (Canadian Cancer Society)
20. Exploding the Myths About Weight Control. (Action B.C.)
21. Prescription for Fitness. (B.C. Medical Association)
22. Good Eating to Guard Your Heart. (B.C. Ministry of Health)
23. Tensions - and How to Master Them. (B.C. Heart Foundation)
24. Overweight - A Problem for Millions. (B.C. Heart Foundation)
25. Women and Smoking. (B.C. Heart Foundation)

FITNESS MEMO - 1

To: Peace Arch Hospital Employees

From: Mike MacLeod, Action B.C. Fitness Consultant

I will be available for personal consultation next week on:

Tuesday (March 27th), 11:00 a.m. - 5:30 p.m.

Friday (March 30th), 11:00 a.m. - 1:30 p.m.

Feel free to drop by the Peace Arch Exercise Room (Basement of E.C.U. II) during these times to discuss your ideas, problems or questions on physical fitness, nutrition, exercise recommendations, lifestyle modification, etc. Also, take a few minutes to browse through the "Health and Fitness Library" which is housed in the Exercise Room. It contains some excellent literature!

FITNESS MEMO - 2

To: Hospital Employees

From: Mike MacLeod, Action B.C. Fitness Consultant

I will be available for personal consultation on:

Tuesday (April 3rd), 11:30 a.m. - 5:30 p.m.

Friday (April 6th), 11:00 a.m. - 2:00 p.m.

There have been a lot of questions directed to me about running injuries, how to start on a jogging program, the proper type of jogging shoes and the biomechanics of jogging. On Tuesday I will be prepared to discuss these questions on an impromptu basis with those interested. I will also have a number of jogging shoes on hand so as to provide a "Jogging Shoe" clinic. Feel free to drop by the Exercise Room (Bottom of E.C.U. II) at your convenience with your questions about jogging!

Next Friday (April 6th), the film, "Physical Fitness - A New Perspective" will be run every half hour from 11:30 a.m. - 1:00 p.m. This film is very informative, so grab your lunch and bring a friend down to the Exercise Room! Check the monthly In-Service calendar for future films and workshops to be held weekly on either Wednesdays or Fridays. This "Lifestyle Education" program deals with various aspects of physical fitness, nutrition, stress reduction and lifestyle risk factors.

FITNESS MEMO - 2 (cont'd)

For those employees who were not initially tested for physical fitness and lifestyle risk factors, please feel free to take part in any of the fitness classes or lifestyle education sessions. The Peace Arch Hospital fitness program is open to all employees. If you desire a personal exercise program drop by and see me at your convenience!

For those who were initially tested, a new month has arrived so remember to drop off your monthly progress card to Jacquie or Ruth and pick up a new one. Your cooperation regarding this matter is really appreciated as it assists me with my personal research!

Remember that the Peace Arch Hospital Employee Fitness Program is 'working for you' so take advantage of the program if you have not already done so!

"The body is the temple of the soul,
And to reach harmony of body, mind and
Spirit, the body must be physically fit"

Aristotle

FITNESS MEMO - 3

To: Peace Arch Hospital Employees

From: Mike MacLeod, Action B.C. Fitness Consultant

I will be available for personal consultation next week on:

Tuesday (April 10th), 1:30 p.m. - 5:30 p.m.

From 11:30 a.m. - 1:00 p.m. I will hold a workshop on the biomechanics of jogging and the prevention of jogging injuries. I will also discuss the characteristics of a good jogging shoe. For those on a jogging program or those who are interested in getting started, this workshop will provide valuable information!

The "Awareness Through Movement" workshop originally scheduled for April 11th has been cancelled and rescheduled for May 16th.

An "Aerobic Circuit" has been set up in the exercise room and is available to all employees to use at their convenience. There are ten stations, each station consisting of a different exercise. The station charts provide instructions and diagrammatic representations of the exercises. The exercises are designed to increase cardiorespiratory fitness, flexibility, and muscular endurance. Music to "Work-out By" is available in Ruth Kendall's office. The aerobic circuit is a fun way to exercise, so come on down to the exercise room and give it a try!

FITNESS MEMO - 4

To: Peace Arch Hospital Employees

From: Mike MacLeod, Action B.C. Fitness Consultant

On Friday, April 20th, 11:30 a.m. to 1:30 p.m., the exceptional film "Coping with Life on the Run" will be shown every half hour. This film, part of the "Lifestyle Education" series, is narrated by Dr. George Sheehan, one of the leading proponents of exercise and preventive medicine in the U.S. Due to the high quality and extremely interesting subject matter of this film, I urge you to bring your lunch and a friend down to the Exercise Room for one of the half hour sessions. It could change your life!

FITNESS MEMO - 5

To: Peace Arch District Hospital

From: Mike MacLeod, Action B.C. Fitness Consultant

The Vancouver International Marathon will be held on Sunday, May 6th starting at 0730. The organizers of this spectacular event have requested volunteers to help out with the "aid" stations. If you are interested in helping out, a volunteers meeting will be held on Tuesday April 24th at 1930 hours at Robson Square in downtown Vancouver.

Any doctors, nurses or physios who are interested in helping out in the medical tents are asked to contact Clyde Smith at 689-7301. This 26.2 mile race is a fantastic display of physical fitness and endurance. I encourage everybody to get into Vancouver on May 6th and cheer those runners on! Who knows, one of these days you might be there!

On Friday, April 27th the film "Stress" will be shown every half hour from 11:30 a.m. to 1:00 p.m. This film examines the concepts of stress in conjunction with a variety of people and lifestyles.

I will be available for private consultation on:

Tuesday, (April 24th), 11:30 a.m. - 3:30 p.m.

FITNESS MEMO - 5 (cont'd)

Remember - Keep those monthly progress cards up to date! Those who have not handed in the March progress cards are asked to get them in and pick up the April cards. Better late than never!

"Man was made to work and play"

Dr. George Sheehan

"An athlete is someone who makes the most of their genetic endowment by training in the environment"

Dr. George Sheehan

WE CAN ALL BE ATHLETES!

APPENDIX 6

INDIVIDUAL RAW SCORES

INDIVIDUAL RAW SCORES
PRETEST DATA

Subject No.	Age (yrs)	Group	Predicted MV _O ₂ (ml/kg/min)	Percent Body Fat	Sit and Reach (cm)
1	44	1	25.0	23.5	22.0
2	26	1	22.8	30.0	35.5
3	24	1	27.0	25.5	35.0
4	35	1	22.8	27.0	25.0
5	35	1	30.0	15.0	32.0
6	51	1	26.8	33.0	39.0
7	29	1	29.8	17.5	37.5
8	31	1	22.0	22.0	38.0
9	27	1	29.8	19.0	31.0
10	55	1	28.0	16.5	36.0
11	39	1	20.8	37.0	35.0
12	22	1	31.8	23.0	26.5
13	59	2	31.8	21.0	44.2
14	29	2	20.8	20.0	41.0
15	44	2	27.0	26.0	41.0
16	46	2	23.8	22.0	37.0
17	35	2	25.8	20.0	34.0
18	20	2	20.8	27.0	37.0
19	34	2	29.8	20.0	35.0
20	30	2	28.0	14.5	34.0
21	32	2	20.0	29.5	37.4
22	47	2	27.8	25.0	40.5
23	36	2	21.8	26.5	26.0
24	28	2	25.8	30.0	39.0
25	31	2	35.8	19.5	37.3
26	53	3	25.8	35.0	23.0
27	51	3	26.0	20.5	25.0
28	49	3	31.8	22.0	41.0
29	25	3	17.8	23.0	33.0
30	28	3	32.0	30.0	37.4
31	20	3	22.8	21.3	35.5
32	31	3	32.8	26.8	28.0
33	32	3	26.8	24.0	30.0
34	31	3	25.8	21.3	48.5
35	25	3	24.8	20.0	41.0
36	55	3	27.8	29.3	28.1
37	24	3	24.8	23.2	43.4
38	33	3	17.8	32.1	22.5

INDIVIDUAL RAW SCORES
PRETEST DATA (continued)

Subject No.	Back Extension (cm)	Shoulder Extension (cm)	T.S.C.S.	Appraised Age (yrs)	kcal/s
1	32.0	15.0		48	1967
2	38.0	18.0		23	2740
3	37.1	37.6		25	2417
4	41.5	24.5		40	1707
5	41.1	23.3	328	33	1793
6	24.5	16.5	322	51	1843
7	36.5	21.5	294	27	1777
8	52.1	30.0	341	30	2391
9	25.5	14.0		28	1913
10	25.0	10.4	363	55	2178
11	24.4	10.0	360	37	2537
12	41.0	25.5	379	21	2066
13	25.5	21.0		58	1572
14	37.0	19.5	380	27	2605
15	35.7	18.9		45	2147
16	29.3	11.1	349	44	2025
17	21.0	12.5	378	33	2306
18	34.2	24.3		12	2097
19	23.8	19.7	333	33	2264
20	41.0	13.0		27	2116
21	30.8	26.0	355	32	2262
22	19.5	04.5	347	43	2356
23	10.0	08.1	341	34	2525
24	33.7	11.5	378	29	2313
25	46.5	18.0	347	31	2057
26	23.0	09.0		57	2532
27	23.8	13.0		55	1956
28	24.2	10.0		47	2941
29	31.5	19.5		24	2636
30	15.0	23.5	347	26	2025
31	23.0	34.7		12	2793
32	23.5	21.6		31	2369
33	27.5	10.0	356	30	2333
34	28.6	18.0		35	2192
35	56.5	30.0	305	23	2255
36	12.0	09.4	300	60	2732
37	34.0	53.9		21	1766
38	21.0	13.2	293	35	1756

INDIVIDUAL RAW SCORES
POSTTEST DATA

Subject No.	Age (yrs)	Group	Predicted MVO ₂ (ml/kg/min)	Percent Body Fat	Sit and Reach (cm)
1	44	1	25.0	23.5	22.0
2	26	1	21.8	30.0	38.5
3	24	1	27.0	25.3	35.0
4	35	1	22.8	27.0	25.2
5	35	1	30.0	16.5	28.5
6	51	1	28.8	28.0	41.5
7	29	1	29.8	17.0	37.5
8	31	1	25.8	22.0	45.0
9	27	1	30.8	19.0	32.0
10	55	1	27.8	18.0	29.5
11	39	1	21.8	30.0	35.0
12	22	1	27.8	21.0	24.0
13	59	2	31.8	21.0	44.0
14	29	2	21.8	23.4	41.0
15	44	2	29.8	23.2	42.5
16	46	2	24.8	19.0	41.0
17	35	2	27.8	19.0	40.0
18	20	2	23.8	23.5	36.5
19	34	2	30.8	20.0	37.2
20	30	2	30.8	15.0	41.0
21	32	2	24.8	24.0	38.5
22	47	2	25.8	27.0	41.0
23	36	2	21.8	26.5	30.0
24	28	2	25.8	30.0	39.0
25	31	2	37.8	17.5	40.0
26	53	3	25.8	35.0	23.0
27	51	3	26.0	24.0	28.0
28	49	3	28.8	21.0	39.0
29	25	3	21.8	22.2	33.0
30	28	3	32.0	29.5	37.4
31	20	3	22.8	21.3	35.5
32	31	3	32.8	26.4	28.1
33	32	3	29.8	20.5	30.5
34	31	3	31.8	21.4	45.5
35	25	3	25.8	19.0	41.3
36	55	3	31.8	29.3	29.1
37	24	3	24.8	23.0	41.0
38	33	3	17.8	32.0	22.5

INDIVIDUAL RAW SCORES
POSTTEST DATA (continued)

Subject No.	Back Extension (cm)	Shoulder Extension (cm)	T.S.C.S.	Appraised Age (yrs)	kcal/s
1	32.0	15.0		46	2255
2	38.0	18.0		23	2740
3	37.3	37.6	35	25	2403
4	41.3	24.5	47	40	1987
5	23.0	37.0	397	33	2243
6	34.2	16.5	337	50	2332
7	48.0	28.8	362	27	2448
8	52.0	27.0	358	30	2391
9	37.3	16.8		28	2147
10	25.0	10.0	363	56	2349
11	35.6	14.7	416	35	2245
12	55.6	29.2	387	21	2478
13	25.5	21.2		58	1572
14	40.0	21.3	384	26	2374
15	33.0	29.0	47	46	2374
16	33.4	19.1	370	44	2226
17	36.0	12.5	378	33	2306
18	44.0	16.0		11	2138
19	25.0	21.0	293	33	2604
20	41.0	13.0		27	2373
21	38.3	19.5	357	33	2536
22	12.0	09.6	365	43	2198
23	10.0	27.0	340	34	2137
24	33.7	11.5	372	29	2211
25	49.9	33.2	381	31	2173
26	23.0	09.0		57	2532
27	23.0	31.0		55	2052
28	21.0	10.0		47	3012
29	34.0	19.5		21	2213
30	24.0	20.0	343	27	2467
31	23.2	34.5		12	2793
32	23.5	21.0		31	2369
33	34.4	10.0	379	30	2571
34	28.6	28.7		35	2012
35	56.5	31.3	290	26	2308
36	13.0	09.2	315	55	2713
37	51.4	55.6		23	1628
38	21.0	13.0	274	37	1767

APPENDIX 7
ANOVA TABLES FOR DEPENDENT VARIABLES
(GROUPS 1, 2 AND 3)

ANOVA TABLE FOR PRED. MVO_2

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	1.68	2	0.84	0.02	0.976
Tests (T)	17.09	1	17.09	8.42	0.006
G X T	5.08	2	2.54	1.25	0.298

ANOVA TABLE FOR SIT AND REACH

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	458.83	2	229.41	3.04	0.06
Tests (T)	9.16	1	9.16	2.84	0.101
G X T	21.51	2	10.75	3.33	0.047

ANOVA TABLE FOR SHOULDER EXTENSION

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	251.73	2	125.86	0.7	0.502
Tests (T)	134.91	1	134.91	6.95	0.012
G X T	7.45	2	3.72	0.19	0.826

ANOVA TABLE FOR BACK EXTENSION

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	996.28	2	498.14	2.44	0.102
Tests (T)	153.09	1	153.09	6.49	0.015
G X T	2.73	2	1.36	0.06	0.943

ANOVA TABLE FOR % BODY FAT

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	77.92	2	38.96	0.78	0.464
Tests (T)	10.11	1	10.11	4.24	0.047
G X T	1.78	2	0.89	0.37	0.69

ANOVA TABLE FOR APPRAISED AGE (H.H.A.)

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	5.09	2	2.54	0.01	0.992
Tests (T)	0.23	1	0.23	0.25	0.617
G X T	0.45	2	0.22	0.25	0.782

ANOVA TABLE FOR CALORIC EXPENDITURE

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	211692.43	2	105846.21	0.62	0.544
Tests (T)	165374.06	1	165374.06	6.21	0.017
G X T	161331.84	2	80665.92	3.03	0.061

ANOVA TABLE FOR TENNESSEE SELF CONCEPT SCORES

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	11945.90	2	5972.95	4.21	0.031
Tests (T)	934.40	1	934.40	3.82	0.066
G X T	1285.50	2	642.75	2.63	0.099

APPENDIX 8

ANOVA TABLES FOR DEPENDENT VARIABLES

(HIGH AND LOW ADHERENCE GROUPS)

ANOVA TABLE FOR PRED. MVO_2

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	103.70	1	103.70	3.32	0.076
Tests (T)	30.54	1	30.54	18.38	<0.001
G X T	16.26	1	16.26	9.79	0.003

ANOVA TABLE FOR SIT AND REACH

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	193.74	1	193.74	2.40	0.13
Tests (T)	12.77	1	12.77	3.50	0.069
G X T	3.30	1	3.30	0.91	0.347

ANOVA TABLE FOR SHOULDER EXTENSION

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	65.37	1	65.37	0.36	0.55
Tests (T)	150.64	1	150.64	8.08	0.007
G X T	16.35	1	16.35	0.88	0.355

ANOVA TABLE FOR BACK EXTENSION

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	5.01	1	5.01	0.02	0.882
Tests (T)	233.34	1	233.34	11.45	0.001
G X T	94.87	1	94.87	4.65	0.037

ANOVA TABLE FOR % BODY FAT

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	0.69	1	0.69	0.01	0.907
Tests (T)	20.58	1	20.58	10.67	0.002
G X T	15.84	1	15.84	8.21	0.006

ANOVA TABLE FOR APPRAISED AGE (H.H.A.)

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	185.09	1	185.09	0.61	0.44
Tests (T)	0.86	1	0.86	1.00	0.324
G X T	1.49	1	1.49	1.73	0.197

ANOVA TABLE FOR CALORIC EXPENDITURE

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	1415.75	1	1415.75	0.01	0.928
Tests (T)	200940.03	1	200940.03	6.92	0.012
G X T	48517.92	1	48517.92	1.67	0.204

ANOVA TABLE FOR TENNESSEE SELF CONCEPT SCORE

Source	Sum of Squares	df	Mean Square	F	Prob. F Exceeded
Groups (G)	586.08	1	586.08	0.30	0.589
Tests (T)	1360.77	1	1360.77	4.97	0.038
G X T	489.34	1	489.34	1.79	0.196