1984

Aerobic fitness training and health locus of control

Timothy R. Wenzel
The University of Montana

AEROBIC FITNESS TRAINING AND HEALTH LOCUS OF CONTROL

BY

TIMOTHY R. WENZEL

BSC., UNIVERSITY OF WATERLOO, 1976

presented in partial fulfillment

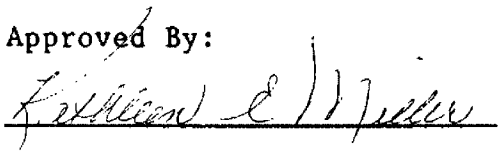
of the requirements for the degree of

MASTER OF SCIENCE

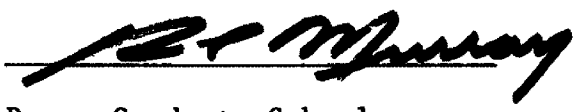
UNIVERSITY OF MONTANA

1984

Approved By:



Chairman, Board of Examiners



Dean, Graduate School

12-20-84

Date

12..

Abstract

Wenzel, Timothy, M.S., November 1984, Health, Physical Education and Recreation

Aerobic Fitness Training and Health Locus of Control (55pp)

Director: Dr. Kathleen Miller KM

This paper reports the results of a study which sought to investigate the effect of a ten week aerobic fitness training program on a subject's score from the Health Locus of Control Scale. Subjects were 69 students enrolled in the Physical Education (PHED 1115) class in the 1983-84 academic year in the Justice Administration and Youth Development Program at Mount Royal College, Calgary, Alberta, Canada. The research hypothesis was that there would be a significant change in the scores from the external to internal indices on the Health Locus of Control Scale with those subjects who improved on their aerobic fitness level over the ten week training program. However, the null hypothesis was accepted. The correlation between the change in the subjects' fitness levels and their scores on the Health Locus of Control Scale was .13. The results however did indicate that when the post-test scores were compared between the control group and the experimental group from the Health Locus of Control Scale the mean scores of the control group actually decreased while scores for the experimental group increased. The change for each group was limited however to the same level, specifically the 'moderately internal' level.

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to my chairman, Dr. Kathy Miller for her unselfish time and consideration throughout my graduate program. As well, I am grateful to Drs. Tom Whiddon and Dave Stroebel for being members of my committee. Finally, I would like to thank my wife Marcia who gave up a great deal on my behalf.

TABLE OF CONTENTS

TABLE OF APPENDICIES

TABLE OF TABLES

CHAPTER I

INTRODUCTION

Physical exercise has become increasingly popular in recent years. As well, there has been a growing interest in pursuing relationships between an individual's psychological and physiological functioning. Physical educators, exercise physiologists, psychologists, rehabilitation counselors, psychiatrists, and physicians all have addressed this issue with some degree of optimism (12).

The relative relationship of actual and perceived aerobic fitness to psychological functioning has not been made totally clear and is an area which requires further testing. This relationship has not been previously combined in an attempt to answer important questions concerning physical or cognitive causality of emotional or psychological states (16).

Some researchers assumed that physical fitness improvements give people a sense of mastery or a sense of having control over bodily functions which is then associated with an experience of well being (12, 18, 40). Hollandsworth (17) argued that aerobic fitness provides training in biofeedback. Others propose that exercise is a form of meditation which triggers an altered state of consciousness (5,40). The problem with physical fitness training and psychological parameters is that for the most part, the data are merely suggestive. Improvement or change can often be attributed to a Hawthorne effect or to a regression toward the mean (15). Very few studies have employed and documented aerobic fitness parameters with relationships to psychological functions.

In the opinion of the writer, comprehensive research in the area of a well documented aerobic fitness training program with a study of its relationship with subjects' responses on the Health Locus of Control Scale was warranted. The Health Locus of Control Scale deals with health related expectancies and not with actual behaviors. A study of this nature will be beneficial to researchers who are interested in the possible relationship of an aerobic fitness training program to an individual's attitude toward health.

STATEMENT OF THE PROBLEM

The purpose of this study was to investigate the effect of a ten week aerobic fitness training program on a subject's score from the Health Locus Control Scale.

SUB-PROBLEMS

1. Determine and document each subject's aerobic fitness level before and after the ten week aerobic fitness training program.
2. Document and establish each subject's fitness training zone category.

HYPOTHESES

Null Hypothesis

There will be no significant change in the scores from the external to internal indices on the Health Locus of Control Scale with those subjects who improve on their aerobic fitness levels over the ten week training period.

Research Hypothesis

There will be a significant change in the scores from the external to internal indices on the Health Locus of Control Scale with those subjects who improve on their aerobic fitness levels over the ten week training period.

SIGNIFICANCE OF STUDY

The writer has found that further research is needed to provide an objective analysis of the purported positive relationship between aerobic fitness training and health attitude variables. The majority of studies have not dealt with psychological changes related to physical fitness changes. Rather, most studies examine differences on psychological variables between fit and unfit groups and "normal" functioning and "abnormal" functioning groups. Most of the studies do not document fitness effects and as such, are often more appropriately identified as sports participation studies.

The writer has found that experimental fitness training has often been offered to specifically recruited subjects who seek out exposure to the training. This could constitute a selection bias. The design of this study was a pre-test and post-test design which allowed the writer to more effectively monitor the research.

The need for a refining of the locus of control construct has become apparent in recent years (49). "New measures for assessing the construct based on more specific goals and attributes have been created and research has drawn attention to various criteria associated with locus of control" (38:25). The Health Locus of Control Scale was developed and validated by Wallston et al (14, 48, 49) from the Rotter I-E Scale. Both the Health

Locus of Control Scale and the Rotter I-E Scale deal with a general measure of expectancy and not with actual behaviors. However, the Health Locus of Control Scale deals with health related expectancies.

Lefcourt and Rotter suggested that the focus of locus of control research is most often on the perception of control as a relatively stable characteristic of individuals. Wallston and Wallston (48,49) have discussed the difficulty of predicting behavior in a specific area as health when using measures of generalized expectancies such as Rotters I-E Scale. The Health Locus of Control Scale was developed by Wallston and Wallston (14, 49) to provide a more sensitive prediction of the relationship between internality and health behavior. In the view of the writer, further research in the relationship of the Health Locus of Control Scale and physical fitness training could aid physical educators, psychologists, physiologists, psychiatrists, and physicians in examining changing attitudes towards health. This attitude change could result from a behavior change which might lead to an improvement in an individual's aerobic fitness level. Seligman suggested that "helplessness is the psychological state that frequently results when events are uncontrollable" (4:14). If this statement is extrapolated to health in general, researchers can become aware of the possible importance of changing one's attitude towards health by way of aerobic training. As well, Phares (1976) "proposed that the cognitive and motivational aspects of the I-E dimension lead internals to a superior position in exerting power and control over their environment" (31:78). Strickland (1978) stated that "if this is the case, the I-E expectancies may have significant impact in relation to health maintenance, a most important personal concern for many of us" (44:1193).

LIMITATIONS

The subjects constituted a convenience, rather than a random sample, since the subjects were selected from classes on the basis of enrollment.

DELIMITATIONS

This study investigated the relationship of a ten week aerobic fitness training program on the pre-test and post-test scores of internality and externality from the Health Locus of Control Scale. The participants in this study were sixty-nine students enrolled in the Justice Administration and Youth Development Program at Mount Royal College, Calgary, Alberta in the 1983-84 academic year. Subjects for the experimental group were thirty-three students enrolled in Physical Education (PHED 1115), a specific course requirement designed for Justice Administration and Youth Development Program students. Subjects for the control group were Justice Administration and Youth Development Program students who had not and were not presently enrolled in Physical Education (PHED 1115).

DEFINITION OF TERMS

Aerobic Fitness

Maximum ability to take in, transport, and utilize oxygen while engaging in exercise.

External Locus of Control

The perception by an individual who feels that his health is controlled by something outside of him and that there is little he can do to alter the events that affect his health.

Greater Adaptive Functioning

This is a belief that individuals who hold internal expectancies as

compared to external expectancies are more likely able to adopt a change in their perception and attitude towards health related behaviors.

Health Locus of Control Scale

This is an area specific measure of expectancies with respect to locus of control for the prediction of health related behavior.

Internal Locus of Control

The perception by an individual who feels that his health is mainly controlled by himself and his behavior.

CHAPTER II

REVIEW OF LITERATURE

This study was concerned with the effect of aerobic fitness training on Health Locus of Control Scores. The purpose of this chapter is to present any findings (historical, related and specific) which have to do with this topic.

GENERAL HISTORY

Health concerns constitute a major concern in today's society. Findings from a vast range of studies have shown indications that individuals holding internal as opposed to external expectancies generally have a greater adaptive functioning (43). The Internal-External control of reinforcement dimension is an expectancy variable from Rotter's social learning theory (22, 31, 33). Internal-External expectancies are determined and assessed by questionnaires and the Rotter I-E scale has been the most common instrument for research with adults. Other multi-dimensional instruments have also been devised to assess I-E expectancies. Collins, 1974; Levenson, 1976; Wallston, Kaplan and Maides, 1976; and Kirscht, 1974, have developed I-E measures specific to health.

Studies involving Internal-External (I-E) expectancies and health related behaviors are numerous (3, 4, 20, 25, 34, 43, 44). I-E studies have researched topics in relation to health knowledge varying from prevention to susceptibility, to precautionary health care, to psychological responding, treatment and other health related expectancies.

According to Rotter, 1966:

> When a reinforcement is perceived by the subject as following some action of his own but not being entirely contingent upon his action, then in our culture, it is typically perceived as the result of luck, chance, fate, as under the control of powerful others or are unpredictable because of the great complexity of the forces surrounding him. When the event is interpreted in this way by an individual, we have labeled this a belief in external control (E). If the person perceives that the event is contingent upon his own behavior on his relatively permanent characteristics, we have teamed this a belief in internal control (I). (33:1)

Results of research conducted with the various instruments suggested that beliefs about internal versus external control are related in significant and even dramatic ways to health-related behaviors. The Health Locus of Control Scale is an area-specific measure of expectancies regarding locus of control developed for prediction of health related behavior (48, 49).

The I-E dimension is a generalized expectancy that occurs when individuals have learned that events are contingent or non-contingent on behavior. The importance of locus of control has been established by years of research (23, 30, 48). Studies by Davis and Davis, 1972 and Phares et al, 1971 showed that internals are more likely than externals to take responsibility for their actions. Their research also suggested that individuals who believe that events are related to their own behaviors are more likely than persons trusting fate or powers beyond their control to take steps to change aversive life situations. A study by Phares in 1976 proposed that the cognitive and motivational aspects of the I-E dimension lead internals to a superior position in exacting power and control over their environment. I-E expectancies, therefore, may have a significant impact in relation to the important concern of health maintenance.

HEALTH BEHAVIOR

Wallston and Wallston (47) noticed that internals appear more likely than externals to engage in positive health sick role behaviors. As well in a study by Kaplar (20) on the Health Locus of Control value in the prediction of smoking reduction, the researcher found that subjects who held internally oriented Health Locus of Control beliefs and who valued health highly were most successful in achieving and maintaining changes in their smoking behavior. Further studies suggested that individuals who were not smokers and individuals who were able to stop smoking were more internal than individuals who smoked (28, 41, 42, 47, 48, 49). However, these results have not always been replicated (8, 26), but the research does suggest that individuals with internal rather than external expectancies are more likely to take action to improve health habits, specifically when made aware that needed changes may result in improved physical functioning. Numerous other studies have documented similar findings in regard to changes in smoking and internal behavior (7, 28, 50).

In a study by Chavez (6) on the evaluation of the Health Locus of Control for obesity treatment, Chavez suggested that the Health Locus of Control questionnaire may be useful in predicting difference in performance in obesity treatment programs on the basis that obesity is a health problem affected by the individual's ability to control pertinent factors. He found that in his weight reduction program that thirty-one internal college students lost significantly more weight than did twelve externals. As well, Balch and Ross (1975) tested thirty-four women and reported internal beliefs to be predictive of both success in and completion of an overweight treatment program. Other researchers have not found that the Internal/ External relates to attempts at weight loss (2, 27, 45), although some

reported the overweight subjects to be external which was also supported by O'Bryan (1972). The Wallstons (47) also found that internals who value their health are more likely than others to collect information about disease and health maintenance when alerted to possible hazards.

TRAINING AND EXERCISE

Few studies have looked at the effects of aerobic fitness training and exercise on Health Locus of Control. Sandstroem and Kampper (35) investigated the prediction of athletic participation in middle school males using the Physical Estimation and Attraction Scales (PEAS) and Bialer's Locus of Control Scale. The researchers concluded that PEAS factor scores and Locus of Control did not significantly predict athletic team adherance during a cross country season. The results also suggested that with the extensive variety of athletic opportunities available within the community, that many boys with high PEAS and Locus of Control scores may have dropped from the team in order to pursue comparable sport participation.

A study by Duke et al (11) was completed to determine if children age 6 to 14 years would experience a greater internal locus of control as a result of participation on an eight week sports fitness camp. The results indicated that significant changes from an external to internal locus of control were realized as well as significant improvements in six fitness parameters. There was a problem with the study, however, due to the inability to completely identify which were the critical components responsible for feelings of control in the children. During the research it was not possible to include a control group because of the obligation to the children who enrolled in the camp. Duke et al (11) have noted that

other studies by Marcus, Nowicki and Piotrowski have indicated that there is not a tendancy for scores of subjects to become more internal over time. However, Duke suggested that while there may have been some regression to the mean in the present scores, regression was not the primary reason for significant movement toward the internality of the campers.

In a study by Jeffers (19) the effects of cardiovascular fitness training on locus of control, body image and interpersonal relationship orientation of university males and females were investigated. Jeffers, using Rotter's I-E Scale found Locus of Control Scores were significantly lowered, reflecting more internal control in his university male population following their participation in a twelve-week physical conditioning program. Changes were significant when compared with pre-test scores and with control group scores. He also found that female students who experienced a physical fitness program indicated significantly lower locus of control scores, reflecting more internal control when compared with pre-test scores. Within group comparison with a control group did not result in significance.

SUMMARY OF LITERATURE

The majority of the research in the area of health behavior has used the Rotter I-E scale. The Health Locus of Control Scale was developed to be used as a more valid and reliable measure for prediction of health-related behavior. The related studies indicated that very little research has been attempted to correlate the effects of physical conditioning on locus of control. To the writer's knowledge, no study has investigated the effect of aerobic fitness training using the Health Locus of Control Scale. Strickland stated:

> We are constantly urged to improve our health by losing weight, jogging and engaging in all those inviting, energetic activities

> designed to enhance our physical functioning. When we do experience physical or emotional distress, professional health care is more readily available to us than it has been in the past and most of our friends and acquaintances have advice and their own favorite home remedies to share. One would expect that internals, in contrast to externals, would be more sensitive to health messages, would have increased knowledge about health conditions, would attempt to improve physical functioning, and might even, through their own efforts, be less susceptible to physical and psychological dysfunction. (44:1193)

Health practitioners have stated that numerous psychological and physical disorders are exacerbated by behavior, such as lack of exercise, smoking, improper diet, and substance abuse. Additionally, there are problems with treatment programs to individual differences. As Strickland stated; "research with the I-E dimension suggests that beliefs about locus of control of reinforcement are influential in relation to health". (44:1203)

Certain problems related to I-E research should be noted: (1) The I-E variable is only one of a number of factors that aid in the prediction of health attitude and behavior, and; (2) research that has produced insignificant results possibly would not have been published.

> Aside from theoretical concerns, a number of methodological weaknesses are apparent in much of the I-E health research. Controls are often lacking with respect to severity and length of disorder or illness with the use of clinical populations. Moreover, much of the research is correlational in nature and gives no indication of direction of causality. (44:1204)

Another problem is that the majority of research has been conducted with the Rotter scale. Numerous scales have been developed and used recently. The Health Locus of Control Scale developed by the Wallstons is specific to health and is expected to enhance prediction of health-related behaviors.

> In spite of the problems, research on the I-E dimension in relation to health appears to have opened significant avenues of investigation that should be pursued. Although results are not altogether as clear, convincing and free of conflict as one might hope, the bulk of the research is consistent in implying that when faced with health problems, internal individuals do appear to engage in more generally adaptive responses than do externals. (44:1205)

CHAPTER III

DESIGN AND PROCEDURES

The method of study involved the selection of a convenience group of college students. The research group was given one pre-test and post-test. The control group acted simply as a reliability check. This design was based on the scope of the research and the subjects availability to the researcher.

SUBJECTS

The sample for this study consisted of students enrolled in the Physical Education (PHED 1115) class in the 1983-84 academic year (N=69). The subjects were from the Justice Administration and Youth Development Program at Mount Royal College, Calgary, Alberta, Canada. The Physical Education (PHED 1115) course was designed specifically for students enrolled in the Justice Administration and Youth Development Program. Subjects for the control group, which acted as a reliability check, were students enrolled in the Justice Administration and Youth Development Program who had not and were not presently enrolled in the Physical Education (PHED 1115) class.

The experimental group was composed of seventeen females and fifty-two males. The control group consisted of nine females and twenty-four males. The subjects in the experimental group were allotted a certain percentage of their final grade for participating in the study. The grade was not based on improvement of their fitness level but simply on participation so as not to affect their motivation in regards to the study.

There was an attrition of eight subjects from the experimental group during the study. Three subjects were eliminated due to medical reasons; two subjects due to less than eighty percent attendance; two subjects due to terminating the course; and one subject because of a pregnancy.

The subjects constituted a convenience, rather than a random sample, due to their availability. No differentation was made between first year and second year students and the students' age was used for adjustment for their personal training program (see Appendix D).

QUESTIONNAIRE

The questionnaire that was used in this study was the Health Locus of Control (HLC) Scale (see Appendix A). It was developed by Wallston, Kaplan and Maides (1975) because of the difficulty of predicting behavior in a specific area such as health. Their concern for developing the Health Locus of Control Scale was that when using measures of generalized expectancies such as Rotter's (1966) Internal-External Locus of Control (I-E) Scale that it would not provide sensitive enough predictions to the relationship between internality and health related behavior.

PROCEDURE

The subjects were required to do a number of tasks during the study. During the second week of classes, both the control group and the experimental group were given the Student Information and Consent Form (see Appendix B) and each subject completed the Health Locus of Control Scale (see Appendix A). The experimental group was asked to run and or walk a mile and one-half in the fastest time possible in the Mount Royal College gymnasium in order to determine their pre-study fitness level. Following

the ten week training program, each subject in the control group and the experimental group was readministered the Health Locus of Control Scale. The experimental group repeated the mile and one-half run in the fastest time possible in the same gymnasium. The scoring and interpretation for the Health Locus of Control Scale was undertaken and recorded by the researcher prior to both the pre-test and post-test one and one-half mile run (see Appendix C). An increase in a score on the Health Locus of Control Scals indicated an increase in internalization.

The procedure for the one and one-half mile run was reviewed with the subjects in the experimental group as follows. (1) After a light warm-up prior to the run an explanation was given which indicated that their time for the run would serve as a good indicator of their aerobic fitness and work capacity. (2) The subjects were divided into two groups which allowed one group to run the mile and one-half while the second group verified and recorded their times. (3) The same format was followed by the second group. Following the run each subject received the Fitness Adjustment Handout (see Appendix D) which was used to predict their aerobic fitness in ml/kg/min (Balke, 1963; Cooper, 1970; Sharkey, 1977). The score was used by the researcher to determine each subject's fitness category according to Sharkey. (32:36)

Fitness Score (ml/kg/min)	Fitness Category
Over 45	High
35-45	Medium
Under 35	Low

The fitness score (ml/kg/min) which indicated the subjects fitness category was then used to calculate the aerobic fitness training zone for each subject (Sharkey, 1977) (see Appendix E).

The experimental subjects then embarked on a ten week aerobic fitness training program. Each training session consisted of a five minute warm

up, a thirty minute aerobic training session involving walking, jogging, and/or running depending on each subject's fitness level, and a five minute cool down. Sharkey recommended that;

> during both the warm-up and cool down period, particular attention should be paid to (1) stretching the lower back to reduce risk of back problems, and (2) stretching hamstring and calf muscles to prevent soreness and reduce the risk of injury. A gradual cool down after exercise is as important as the warm up. (32:53)

During the aerobic training session, the researcher stopped the subjects at exactly the 10-minute and 20-minute intervals of the aerobic training session and had each subject take his pulse to ensure that he was exercising within his target heart zone. The subjects were then encouraged to either increase or decrease their intensity so that they were exercising within their target heart zone.

Sharkey indicated that;

> The easiest way to determine intensity is to check your heart rate during or just after exercise. Generally speaking, heart rates below 120 characterize LOW intensity aerobic effort; rates between 120 and 160 indicate MODERATE intensity aerobic effort; and rates between 160 and 180 indicate HIGH intensity aerobic effort. (40:11)

Sedlock et al stated that for subjects who are taking their own pulse, it is important that they; "(1) receive adequate instruction in the technique to be used, (2) are given a short period of practice time, and (3) complete the palpatation within 15 seconds after cessation of exercise." (36:116) The experimental subjects had practice taking their own pulse prior to the first training session. The radial pulse was used and the subjects were instructed according to the following procedure: Right handed people used the two fingers, never the thumb, of their right hand to count the pulse on their left wrist; the pulse area was indicated to be in the groove directly above the base of the thumb on the underside of the wrist; the subjects were asked to stop running and to find their

pulse within approximately 5 seconds; the researcher then indicated to the subjects to start counting 'now'; at the completion of ten seconds the researcher then indicated 'stop'; subjects multiplied their pulse count by six to determine their pulse rate; subjects then continued running and corrected their intensity of exercise as required. The researcher trained the subjects the entire ten weeks in the gymnasium in order to insure that correct training intensities of individual subjects were adhered to. To alleviate possible boredom, contemporary music was played to enhance the enjoyment of the training session.

The final task required was the administration of the 'Physical Activity Log" (see Appendix F). The 'Physical Activity Log' was administered on a weekly basis and collected by the researcher. This was done to try to accurately control the reliability and validity of the subjects' responses. The researcher explained that the subjects were to indicate the amount of time spent and the intensity level for all the activities that they took part in for the past week.

STATISTICAL ANALYSIS

Statistical analysis included descriptive statistics and an Analysis of Covariance (ANCOVA). Covariance is essential since the writer was unable to randomingly choose the subjects. Simple correlations were used. The correlations coefficient is a measure of the relationship between two variables. It can take on values from positive 1.00 to negative 1.00 while zero indicates no relationships. The variance was the change in fitness level compared to scores on the Health Locus of Control Scale. Within group variance was also analyzed. Only changes were indicated and therefore the results did not get at a causal relationship.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

Demographic Data

In the experimental group, 75 percent of the subjects were male. The mean age was 20.69 years with a standard deviation of 2.82. Age of the experimental subjects varied from 17 years to 31 years. Sixty-eight percent of the experimental subjects were first year college students in the Justice Administration and Youth Development Program in the 1983-84 academic year, Mount Royal College, Calgary, Alberta.

Seventy-three percent of the subjects in the control group were male. The mean age was 19.48 years with a standard deviation of 2.15. The control group subjects varied from 18 years to 27 years of age. Seventy-two percent of the control subjects were first year college students in the Justice Administration and Youth Development Program in the 1983-84 academic year, Mount Royal College, Calgary, Alberta (see Table 1).

Table 1. Demographic Data for Experimental and Control Subjects

	Experimental Subjects	Control Subjects
Mean Age	20.69	19.48
Standard Deviation-Age	2.82	2.15
First Year Students	68%	72%
Males	75%	73%

Fitness Levels, Scores and Times

The subjects in the experimental group were required to run and/or walk the mile and one-half in order to document their pre-test and post-

test fitness levels. The mean pre-test time for the mile and one-half run was eleven minutes and thirty-six seconds with a standard deviation of two minutes and twenty seconds. The mean post-test time for the one and one-half mile run was ten minutes and thirty-nine seconds with a standard deviation of one minute and forty-six seconds. The mean time difference was a decrease of fifty-seven seconds. The greatest variance was a decrease of three minutes and two seconds. One subject showed an increase of one minute and seven seconds (see Appendix M). Ninety-one percent of the subjects showed an improvement in their times for the one and one-half mile run.

Prediction of the subject's fitness scores in (ml/kg/min) was determined from their mile and one-half times (see Appendix D). Their predicted fitness score was used to determine each individuals' aerobic fitness training zone. A fitness score of 34 and lower in (ml/kg/min) indicated a 'low' training zone. Fitness scores of 35 to 45 in (ml/kg/min) indicated a 'medium' training zone. Fitness scores of 46 and higher in (ml/kg/min) indicated a 'high' training zone. Sixty-two percent of the subjects were classified as being in the 'high' fitness training zone followed by 22 percent in the 'medium' fitness training zone (see Appendix N). The control group was not required to run the mile and one-half since they acted simply as a reliability check.

Health Locus of Control Scores

The control group had a mean pre-test score of 11.0 with a standard deviation of 8.3 on the Health Locus of Control Scale. The mean post-test score for the control group was 10.6 with a standard deviation of 7.6. The mean score difference from the pre-test to the post-test was .4 with a

standard deviation of 3.4 on the post-test. On both the pre-test and post-test, the control group was classified as being in the 'moderately internal' level (see Appendix C). On the pre-test 40 percent of the subjects were classified as being 'slightly internal', while 33 percent were classified as being 'moderately internal' and 15 percent were classified as being 'strongly internal'. On the post-test 46 percent of the subjects were classified as being 'moderately internal' while 33 percent were classified as 'slightly internal' and 12 percent as 'strongly internal' (see Table 2).

Table 2. Control Group Health Locus of Control Scores

	Pre-Test	Post-Test
Strongly External (-20 to -33)	0%	0%
Moderately External (-10 to -19)	0%	0%
Slightly External (-2 to -9)	6%	6%
Somewhat External and Internal (-1 to +1)	6%	3%
Slightly Internal (+2 to +9)	40%	33%
Moderately Internal (+10 to +19)	33%	46%
Strongly Internal (+20 to +33)	15%	12%

Scores from the Health Locus of Control Scale from the pre-test and post-test indicated that 58 percent of the subjects had no change in their level of 'internality'. Twenty-four percent became less internal and moved down a level. Eighteen percent became more internal moving up a level (see Table 3).

Table 3. Control Group Individual Pre and Post-Test Scores on the Health Locus of Control Scale

Subjects who became more 'Internal' - same level	28%
Subjects who became more 'Internal' - up a level	18%
Subjects who became less 'Internal' - same level	24%
Subjects who became less 'Internal' - down a level	24%
Subjects who scored the same	6%
Overall: no change or same level of 'Internality'	58%
Overall: less 'Internal' - down a level	24%
Overall: more 'Internal' - up a level	18%

The experimental group had a mean pre-test score of 11.6 with a standard deviation of 8.5 on the Health Locus of Control Scale. The mean post-test score was 13.7 with a standard deviation of 7.5 on the post-test. The mean difference from the pre-test and post-test was 2.1 with a standard deviation of 6.8. The experimental group's mean score indicated that they were classified as being 'moderately internal' on both the pre and post-test. On the pre-test, 45 percent of the subjects were classified as being 'moderately' internal; while 26 percent were classified as being 'slightly' internal; and 20 percent as 'strongly' internal. On the post-test 49 percent of the subjects were classified as being 'moderately' internal while 28 percent were classified as being 'slightly' internal and 19 percent as 'strongly' internal (see Table 4).

Table 4. Experimental Group Health Locus of Control Scores

	Pre-Test	Post-Test
Strongly External (-20 to -33)	0%	0%
Moderately External (-10 to -19)	3%	0%
Slightly External (-2 to -9)	3%	2%
Somewhat External and Internal (-1 to +1)	3%	2%
Slightly Internal (+2 to +9)	26%	28%
Moderately Internal (+10 to +19)	45%	49%
Strongly Internal (+20 to +33)	20%	19%

Scores from the pre-test and post-test indicated that 48 percent of the experimental subjects had no change in their level of 'internality'. Thirty-one percent of the subjects became more 'internal' moving up at least one level. Twenty-one percent of the subjects became less internal moving down at least one level. The most significant change in 'internality' was exhibited by one subject who moved up four levels of internality. The most significant change in 'externality' was revealed by one subject moving down two levels of 'internality' (see Table 5).

Table 5. Experimental Group - Individual Pre and Post Test Scores on the Health Locus of Control Scale

Subjects who became more 'Internal' - same level	22%
Subjects who became more 'Internal' - up a level	26%
Subjects who became less 'Internal' - same level	20%
Subjects who became less 'Internal' - down a level	20%
Subjects who scored the same	6%
Subjects who became less 'Internal' - down two levels	1%
Subjects who became more 'Internal' - up two levels	2%
Subjects who became more 'Internal' - up three levels	2%
Subjects who became more 'Internal' - up four levels	1%
Overall: no change or same level of 'Internality'	48%
Overall: more 'Internal' - moving up at least one level	31%
Overall: less 'Internal' - moving down at least one level	21%

The purpose of the study was to investigate the effect of a ten week aerobic fitness training program on a subject's score from the Health Locus of Control Scale. The covariance in this study, signifying the difference between the two variables - the ten week fitness training program and the scores from the Health Locus of Control Scale, was 55.18. The correlation which unitized this covariance was r=.13 indicating a slightly positive correlation between the two variables.

Discussion

The rationale for the study was to investigate the purported relationship between the change in aerobic fitness to scores on the Health Locus of Control Scale. The findings indicated that 91 percent of the subjects showed an improvement in their aerobic fitness levels over the ten week training program. This finding is consistent with past research in this area dealing with aerobic training (Sharkey, 1977). A reasonable assumption would be that the majority of the subjects should have improved their fitness level during the study. The guidelines for training followed the recommendations of past researchers (Balke, 1963; Cooper, 1970;

Sharkey, 1977). This study appeared to have a motivated group of subjects in terms of fitness participation as indicated by the fact that 62 percent of the subjects were classified as being in the 'high' fitness level along with 22 percent in the 'medium' fitness level prior to the start of the ten week training regimen. Weekly reporting by the subjects allowed for tabulation of activities outside of the research training sessions (see Appendix F). The activity and the intensity level of each activity was recorded. Fourteen activities were listed in the 'Physical Activity Log' along with ten 'other' activities that were listed by the subjects. The most popular activities were jogging, dancing and swimming at 68, 58 and 42 percent respectively (see Table 6).

Table 6. Participation in Various Outside Activities by Experimental Subjects

ACTIVITY	PERCENTAGE OF SUBJECTS PARTICIPATING
Jogging	68%
Bicycling	20%
Swimming	42%
Squash	7%
Racquetball	22%
Badminton	12%
Basketball	28%
Hockey	28%
Calisthenics	26%
Dancing	58%
Football	2%
Soccer	13%
Tennis	4%
Wrestling	12%
OTHER	
Ice Skating	3%
Roller Skating	1%
Muscercises	1%
X-Country Skiing	6%
Walking	9%
Floor Hockey	4%
Volleyball	10%
Jazzercise	1%
Judo	1%
Boxing	1%

The researcher did not feel that the participation in aerobic activities had an effect on the final fitness levels of the subjects. The results initially indicated that 62 percent of the subjects were already classified as being in the 'high' fitness training zone. A reasonable assumption would follow that these subjects had not just adopted an active lifestyle during the study. The majority of the subjects already participated in the minimum amount of weekly exercise required to qualify for a maintenance program. According to Cooper and Sharkey this is three times a week with your heart rate in your target zone for a minimum of twenty minutes for each training session. The change in the subjects' fitness levels could be due to the addition of the research training sessions. Activity sessions outside of the research training sessions indicated that 93 percent of the subjects trained in the 'medium' fitness training zone, followed by 59 percent in the 'high' training zone and 45 percent in the 'low' training zone (see Table 7).

Table 7. Training Zones Mean Time Participation by Experimental Subjects in Activities Outside of the Research Training Session

Training Zone	Mean Time Weekly	Percentage of Subjects Training in each Zone
High	70 minutes	59%
Medium	68 minutes	93%
Low	61 minutes	45%

The number of activity sessions per subject was unavailable. By analyzing the duration and intensities of exercise, this researcher felt that it may be assumed the minimum number of activity sessions per subject would have been at least three per week.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the study, presents the findings and conclusions and suggests recommendations for further research in this area.

Summary

The purpose of this study was to investigate the effect of a ten week aerobic fitness training program to a subject's score from the Health Locus of Control Scale. The sub-problems of this study were to:

1. Determine and document each subject's aerobic fitness level before and after the ten week aerobic fitness training program.
2. Calculate and specify each subject's fitness training zone category.

The study was delimited to students enrolled in the Justice Administration and Youth Development Program in the 1983-84 academic year at Mount Royal College, Calgary, Alberta. Subjects for the experimental group were students enrolled in Physical Education (PHED 1115), a specific course requirement designed for Justice Administration and Youth Development Program students. Subjects for the control group were Justice Administration and Youth Development Program students who had not and were not presently enrolled in Physical Education (PHED 1115).

The subjects were required to do a number of tasks. Initially they were required to complete the 'Student Information Form' (see Appendix B) and the 'Health Locus of Control Scale" (see Appendix A). The experimental subjects were required to run and/or walk the mile and one-half in the

fastest time possible in order to determine their pre-study fitness level and training zone. The experimental subjects were also required to complete the 'Physical Activities Log' (see Appendix F) on a weekly basis for the ten weeks. Following the ten week training program each subject was readministered the Health Locus of Control Scale. The experimental group then repeated the mile and one-half run.

Findings

The findings for this study on the effect of aerobic fitness training on the Health Locus of Control scores are summarized as follows:

1. The majority of the subjects in the study were male. The mean age of the experimental subjects was 20.69 years of age. The mean age of the control subjects was 19.48 years of age. Seventy-two percent of the subjects were first year college students in the Justice Administration and Youth Development Program.
2. The pre-test fitness scores indicated that 62 percent of the subjects were classified as being in the 'high' fitness level followed by 22 percent in the 'medium' fitness level and 16 percent in the 'low' fitness level.
3. All but one subject participated in aerobic fitness activities outside of the research training session. The three most popular activities were jogging, dancing and swimming respectively.
4. In activities engaged in outside of the research training sessions the majority of the subjects trained in the 'medium training zone, followed by the 'high' and 'low' training zones respectively.
5. Ninety-one percent of the subjects showed an improvement in their times for their mile and one-half run.

6. Health Locus of Control scores for the control subjects classified this group as 'moderately' internal on both the pre-test and post-test.
7. Health Locus of Control scores for the experimental subjects indicated this group to be classified as 'moderately' internal on both the pre-test and post-test.
8. Results from the control group indicated that 58 percent of the subjects had no change in their level of 'internality' from their pre-test and post-test scores. Twenty-four percent became less internal and moved down a level, while 18 percent became more internal moving up a level.
9. Results from the experimental group indicated that 48 percent of the experimental subjects had no change in their level of 'internality' from the pre-test and post-test scores. Thirty-one percent became more internal moving up at least one level, while 21 percent became less internal moving down at least one level.
10. The correlation coefficient (r=.13) between the change in fitness levels to the scores on the Health Locus of Control Scale indicated a slight positive correlation.
11. A correlation coefficient (r=.88) was found between the pre-test and post-test scores of the control group on the Health Locus of Control Scale.

Conclusions

The research hypothesis was that there would be a significant change in the scores from the external to internal indices on the Health Locus of Control Scale with those subjects who improved on their aerobic fitness level over the ten week training program. From a statistical analysis the null hypothesis was accepted. In terms of a practical analysis a reasonable question would be to ask if the improvement in the fitness levels of the subjects was attained by the research training sessions and/or the addition of the outside activity sessions. By studying the subjects' initial fitness levels and the time that the subjects participated in various outside activities, a reasonable assumption might be that there was already a definite 'habit' towards the subjects being active. In view of this speculation, a further reasonable assumption might be that the changes in the subjects' fitness levels may have been mainly caused by the research training sessions. The correlation between the change in the subjects' fitness levels and their scores on the Health Locus of Control Scale indicated only a slightly positive correlation ($r=.13$). This result is not statistically significant. However, if post-test scores are compared between the control group and the experimental group, the data indicates that the mean scores of the control group actually decreased while scores for the experimental group increased. The change for each group was limited however to the same level, specifically the 'moderately' internal level. A practical conclusion might indicate that even a slightly positive correlation for this group of subjects may be more significant than what one might first be expected. Even a small change in the 'Internality' over a short period of time might indicate significance for this group of subjects.

Speculation as to why the changes did not occur are numerous. Health expectancy appears to be a relatively stable characteristic. Aerobic manipulation in this study was not significant enough to change the health expectancy characteristic. The possibility further exists that the Health Locus of Control scores may not have occured because of the 'ceiling effect' and the fact that this group of subjects were already highly fit at the start of the study. A high correlation existed between the pre-test fitness scores and the subjects' scores on the Health Locus of Control Scale. These results aid in the explanation as to why changes may not have been evident due to the 'ceiling effect'. A further premise may indicate that even if the internal subjects were able to change health expectancy it would be difficult to assess because of the 'ceiling effect'. Analysis between 'externals' and 'internals' and Health Locus of Control scores was not undertaken due to the small number of external subjects. The Internal-External variable is only one of many factors that aid in the prediction of health attitudes and behaviors. Research using the Health Locus of Control Scale is relatively recent and further investigation as to its continued viability and validity is needed. Problems with this design were also evident as is with much of the Internal-External research. The majority of the research is correlational in nature and gives no indication of direction of causality. Perhaps the significant changes of internality may never occur. However, the final speculation in regards to this area of research might best be summed up by Strickland, 1978:

> Practical implications are that change agents such as health personnel will be most effective when techniques are tailored to individual expectancies. External individuals evidently respond more easily to conditions in which structure is imposed from outside. Internals prefer situations in which they can assume responsibility and work independently.
>
> The problems extant in the investigations are myriad, but the already observed results hold promise for both theoretical and practical advances. (44:1205)

Recommendations

Based on the findings and the conclusions of this study, the following recommendations are offered:

1. Further research is required in this area over a longer period of time to see if a greater length of training time reveals a more significant effect on 'internality'.
2. Future studies should obtain a random sample of subjects to allow for a more accurate cross-section of the population.
3. The Health Locus of Control Scale and the fitness assessment could be re-administered after a 'layoff' period to see if any change has occured towards health attitude.
4. Studies involving only 'External' oriented individuals with a highly structured aerobic training regimen might prove beneficial.
5. Studies involving only 'Internal' oriented individuals with an independent aerobic training regimen might also prove worthwhile.

BIBLIOGRAPHY

1. Balch, P., & Ross, A. W. Predicting Success in Weight Reduction as a Function of Locus of Control: A Unidimensional and Multidimensional Approach. Journal of Consulting and Clinical Psychology, 1975, 73, 119.

2. Bellack, A. S., Rozensky, R., & Schwartz, J. A. Comparison of Two Forms of Self-Monitoring in a Behavioral Weight Reduction Program. Behavior Therapy, 1974, 5, 523-530.

3. Baughman, Marilyn K. The Relationship of Locus of Control and Value Beliefs to Health Status and Behavior Among Clerical Workers. Dissertation Abstracts, INT, 1979. (March). Vol. 39 (9-A), 5217-5218.

4. Boyle, Edwards and Harnson, Bruce, E. Factor Structure of the Health Locus of Control. Journal of Clinical Psychology, Vol. 37 (4), 819-824.

5. Buffone, G. W. Exercise as Therapy: A Closer Look. Journal of Counseling and Psychotherapy, 1980, 3, 134-139.

6. Chavez, E. L. & Michaels, C. Evaluation of the Health Locus of Control for Obesity Treatment. Psychological Reports, 1980 (Dec.), Vol. 47 (3, Pt. 1), 709-710.

7. Coan, R.W. Personality Variables Associated With Cigarette Smoking.
Journal of Personality and Social Psychology, 1973, 26, 86-104.

8. Collins, B. E. Four Components of the Rotter Internal-External Scale; Belief in a Difficult World, Just World, a Predictable World & a Politically Responsive World. Journal of Personality & Social Psychology, 1974, 29, 381-391.

9. Danaher, B. G. Rapid Smoking and Self Control in the Modification of Smoking Behavior. Journal of Counsulting and Clinical Psychology, 1977, 45, 1068-1075.

10. Davis, W. L. and Davis, P. E. Internal-External Control and Attribution of Responsibility for Success and Failure. Journal of Personality, 1972, 35, 547-561.

11. Duke, M., Johnson, T. C., and Nowick, S., Jr., Effects of Sports Fitness Camp Experience on Locus of Control Orientation in Children Ages 6 to 14. Research Quarterly, 1977, 48, 280-283.

12. Folkins, C. H., and Sime, W. E. Physical Fitness Training and Mental Health. American Psychologist, Vol. 36, No. 4, April 1981, 373-389.

13. Gore, P. M. and Rotter, J. B. A Personality Correlation of Social Action. Journal of Personality, 1963, 31, 58-64.

14. Gorelink, Sally; Ramacher, L. G.; Reede, L. G. Handbook of Scales and Indices of Health Behavior. Goodyear Publishing Co., Inc., Pacific Palisades, California; 1976.

15. Hanson, D. L. Influence of the Hawthorne Effect Upon Physical Education Research. Research Quarterly, 1967, 38, 723-724.

16. Heaps, R. A. Relating Physical and Psychological Fitness: A Psychological Point of View. Journal of Sports Medicine, 18, 1978, 399-402.

17. Hollandsworth, J. G., Jr. Some Thoughts on Distance in Training in Biofeedback. Journal of Sport Behavior, 1979, 2, 71-82.

18. Ismail, A. H. & Trachtman, L. E. Jogging the Imagination. Psychology Today. March, 1973, 79-82.

19. Jeffers, J. M. The Effects of Physical Conditioning on Locus of Control, Body Image, and Interpersonal Relationship Orientation of University Males and Females. Dissertation Abstracts, 1977 (Dec.), Vol. 38 (6-A), 3289-3290.

20. Kaplan, G. D., and Cowles, Ann. Health Locus of Control and Health Value in Prediction of Smoking Reduction. Health Education Monographs. 1978 (Spr.), Vol. 6 (2), 129-137.

21. Kirscht, J. P. Perceptions of Control and Health Beliefs. Canadian Journal of Behavioral Science, 1974, 4, 225-237.

22. Lefcourt, H. M. Locus of Control and Coping with Life's Events. In F. Staub (ed.) Personality, Englewood Cliffs, N.J.: Prentice-Hall, 1979.

23. Levenson, H. Multidimensional Locus of Control in Psychiatric Patients. Journal of Consulting and Clinical Psychology, 1973, 41, 397-404.

24. Levenson, H., and Miller, J. Multidimensional Locus of Control in Sociopolitical Activist of Conservative and Liberal Ideologics. Journal of Personality and Social Psychology, 1976, 33, 199-208.

25. Lewis, F. M.; Marisky, D. E.; Flynn, B. S. A Test of Construct Validity of Health Locus of Control. Effects on Self Control Compliance for Hypertensive Patients. Health Education Monographs, 1978 (Spr.), Vol. 6 (2), 138-148.

26. Lichtenstein, E., and Kreutzer, C. S. Further Normative and Correlative Dates on the Internal-External (I-E) Control of Reinforcement Scale. Psychological Reports, 1967, 21, 1014-1016.

27. Manno, B., and Marsten, A. R. Weight Reduction as a Function of Negative Covert Reinforcement (Sensitization) Versus Positive Covert Reinforcement. Behavior Research and Therapy, 1972, 10, 201-207.

28. Mlott, S. R., and Mlott, Y. D. Dogmatism and Locus of Control in Individuals Who Smoke, Stopped Smoking and Never Smoked. Journal of Community Psychology, 1975, 3, 53, 57.

29. O'Bryan, G. G. The Relationship Between an Individual's I-E Orientation and Information Seeking, Learning, and Use of Weight Control Relevant Information. (Doctoral dissertation, University of Nevada, 1972). Dissertation Abstracts International, 1972, 33, 44713.

30. Olejnik, A. B. Development of Locus of Control. A Review and Model for Further Investigation. Northern Illinois University 20 p; Paper presented at the Annual Interdisciplinary UAP-USL Conference on Diagetion Therapy and the Helping Professions. (Feb. 1979)

31. Phares, E. J. Locus of Control in Personality. Moristown, M. J.; General Learning Press, 1976.

32. Phares, E. J.; Wilson, K. G.; and Klyue, N. W. Internal-External Control and the Attribution of Blame Under Neutral and Distractive Conditions. Journal of Personality and Social Psychology, 1971, 18, 285-288.

33. Rotter, J. B. Generalized Expectancies for Internal Versus External Control of Reinforcement. Psychological Monographs, 1966, 80, Whole No. 1.

34. Saltzer, E. B. Locus of Control and the Intention to Lose Weight. Health Education Monographs, 1978 (Spr.), Vol. 6 (2), 118-128.

35. Sandstroem, R. J.; and Kampper, K. P. Prediction of Athletic Participation in Middle School Males, Research Quarterly, 1980, Vol. 51, No. 4, 685-694.

36. Sedlock, D. A.; Knowlton, R. G.; Fitzgerald, P. I.; Tahomark, M. V.; Schneider, D. A. Accuracy of Subject Palpated Cardial Pulse after Exercise. The Physician and Sportsmedicine. Vol. 11, No. 4, April 1983, 106-116.

37. Seligman, E. P. Helplessness. San Francisco, California: Freeman, 1975.

38. Selignam, E. P., & Garber, J. Human Helplessness, New York. Academic Press, 1980.

39. Sharkey, B. J. Physiology of Fitness. Human Kinetics Publishers, Champaign, Illinois, 1979.

40. Soloman, E. G., and Bumpus, A. K. The Running Meditation Response: An Adjunct to Psychotherapy. American Journal of Psychotherapy, 1978, 583-592.

41. Steffy, R. A., Meichenbaun, D., & Best, J. A. Aversive and Cognitive Factors in the Modification of Smoking Behavior. Behavior Research and Therapy, 1970, 8, 115-125.

42. Straits, B., & Sechrest, L. Further Support of Some Findings About the Characteristics of Smokers and Nonsmokers. Journal of Consulting Psychology, 1973, 2, 319.

43. Strickland, B. R. The Prediction of Social Action From a Dimension of Internal-External Control. Journal of Social Psychology, 1965, 66, 353-358.

44. Strickland, B. R. Internal-External Expectancies and Health Related Behavior. Journal of Consulting and Clinical Psychology, 1978 (Dec.), Vol 46 (G), 1192-1211.

45. Tobias, L. L., & MacDonald, M. L. Internal Locus of Control and Weight Loss: An Insufficient Condition. Journal of Consulting and Clinical Psychology, 1977, 45, 647-653.

46. Turabian, K. L. A Manual for Writers of Term Papers, Thesis, and Dissertations. University of Chicago Press, 1973.

47. Wallston, K. A., Maides, S., and Wallston, B. S. Health-Related Information Seeking as a Function of Health-Related Locus of Control and Health Value. Journal of Research in Personality, 1976, 10, 215-222.

48. Wallston, B. S., Wallston, K. A. Locus of Control and Health. A Review of Literature, Health Education Monographs, 1978 (Spr.), Vol. 6 (2), 107-117.

49. Wallston, B. S., Wallston, K. A., Kaplan, G. D., and Maides, S. A. Development and Validation of the Health Locus of Control Scale. Journal of Consulting and Clinical Psychology, 1976, 44, 580-585.

50. Williams, A. F. Personality and Other Characteristics Associated With Cigarette Smoking Among Young Teenagers. Journal of Health and Social Behavior, 1973, 14, 374-380.

APPENDIX A

Health Locus of Control Scale

Each item listed below is a belief statement regarding health and illness with which you may agree or disagree. Beside each statement is a scale which ranges from strongly agree (a) to strongly disagree (f). For each item you are to circle the number that represents the extent to which you agree of disagree with the statement as it related to your present state of health and illness. Please circle only one number for each item. This is a measure of your personal beliefs; obviously there are no right or wrong answers. Please answer these items carefully but do not spend too much time on any one item. Be sure to answer every item. Also, try to respond to each item independently when making your choice; do not be influenced by your previous choices. It is important that you respond according to your actual beliefs and not according to how you feel you should believe.

		Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree
1.	If I take care of myself I can avoid illness.	a	b	c	d	e	f
2.	Whenever I get sick it is because of something I've done or not done.	a	b	c	d	e	f
3.	Good health is largely a matter of good fortune.	a	b	c	d	e	f
4.	No matter what I do, if I am going to get sick I will get sick.	a	b	c	d	e	f
5.	Most people do not realize the extent to which their illnesses are controlled by accidental happenings.	a	b	c	d	e	f
6.	I can only do what my doctor tells me to do.	a	b	c	d	e	f
7.	There are so many strange diseases around, that you can never know how or when you might pick one up.	a	b	c	d	e	f
8.	When I feel ill, I know it is because I have not been getting the proper exercise or eating right.	a	b	c	d	e	f
9.	People who never get sick are just plain lucky.	a	b	c	d	e	f
10.	People's ill health results from their own carelessness.	a	b	c	d	e	f
11.	I am directly responsible for my health.	a	b	c	d	e	f

APPENDIX B

Student Information and Consent Form

You will be completing the Health Locus of Control Scale before and after the completion of a ten week cardiovascular fitness training program. As well, you will be asked to complete the Physical Activity Log on a weekly basis during the ten week training program. You will also be asked to run a mile and one-half in the fastest time possible at the start and the completion of the ten week training program.

Do you have any questions?

I, _____ in agreeing to participate in the project, hereby certify that I have read and fully understand that:

(a) All information collected in the course of my participation will be treated in the strictest confidence. To ensure anonymity, all information provided me will be coded and will only be available to the researcher, Tim Wenzel.

(b) You may experience normal exercise problems at the beginning of the training program such as muscle soreness, muscle cramps and blisters. This is not uncommon especially if you have not been on a regular exercise program. If any problems develop during the training period, you should specifically inform the instructor and you may be referred to medical care. No problems are anticipated and instruction and supervision will be provided.

(c) My participation is voluntary and I have the right to withdraw from the study at any time although a committment for my participation throughout the study is requested.

(d) Upon completion, a summary of the project findings will be provided to me and all participants upon request although individual results will not be available for review or discussion.

(e) The project is the independent research of the investigator and summaries of the study, its methods and findings, in terms of group characteristics may appear in both scientific and popular publications.

(f) I have read the foregoing and I understand it and any questions which may have occured to me have been answered to my satisfaction.

_____ _____

Participant's Signature Date

APPENDIX C

Scoring and Interpretation for Health Locus of Control

Some people feel their health is controlled by something outside them and that there is little they can do to alter the events that affect their health. Therefore, their health locus of control is EXTERNAL. Others feel their health is mainly controlled by them and their own behavior. Therefore, their health locus of control is INTERNAL. This questionnaire provides you with information about whether your health beliefs are External or Internal. Compare the items you circled with the answer sheet below. Add the minus numbers in one column and the plus number in another column. For example, if you circled b in item one (+2) and c in item two (+1) you would have +3. If you circled f in item one (-3) and e in item two (-2) you would have -5. After you have added all numbers you should have two columns, one columns adds up to a minus number and one column adds up to a plus number. Now add these two numbers algebraically. For example, if you had -15 and +9 you would end up with -6.

The following table indicated your health locus of control.

-20 to -33 = strongly external

-10 to -19 = moderately external

-2 to -9 = slightly external

-1 to +1 = somewhat external and internal

+2 to +9 = slightly internal

+10 to +10 = moderately internal

+20 to +33 = strongly internal

		Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree
1.	If I take care of myself I can avoid illness.	+3 a	+2 b	+1 c	-1 d	-2 e	+3 f
2.	Whenever I get sick it is because of something I've done or not done.	+3 a	+2 b	+1 c	-1 d	-2 e	-3 f
3.	Good health is largely a matter of good fortune.	-3 a	-2 b	-1 c	+1 d	+2 e	+3 f
4.	No matter what I do, if I am going to get sick I will get sick.	-3 a	-2 b	-1 c	+1 d	+2 e	+3 f
5.	Most people do not realize the extent to which their illnesses are controlled by accidental happenings.	-3 a	-2 b	-1 c	+1 d	+2 e	+3 f
6.	I can only do what my doctor tells me do to.	-3 a	-2 b	-1 c	+1 d	+2 e	+3 f
7.	There are so many strange diseases around, that you can never know how or when you might pick one up.	-3 a	-2 b	-1 c	+1 d	+2 e	+3 f
8.	When I feel ill, I know it is because I have not been getting the proper exercise or eating right.	+3 a	+2 b	+1 c	-1 d	-2 e	-3 f
9.	People who never get sick are just plain lucky.	-3 a	-2 b	-1 c	+1 d	+2 e	+3 f
10.	People's ill health results from their own carelessness.	+3 a	+2 b	+1 c	-1 d	-2 e	-3 f
11.	I am directly responsible for my health.	+3 a	+2 b	+1 c	-1 d	-2 e	-3 f

Questions: 1, 2, 8, 10, 11 Internal
Questions: 3, 4, 5, 6, 7, 9 External

APPENDIX D

Aerobic Fitness Training Zones

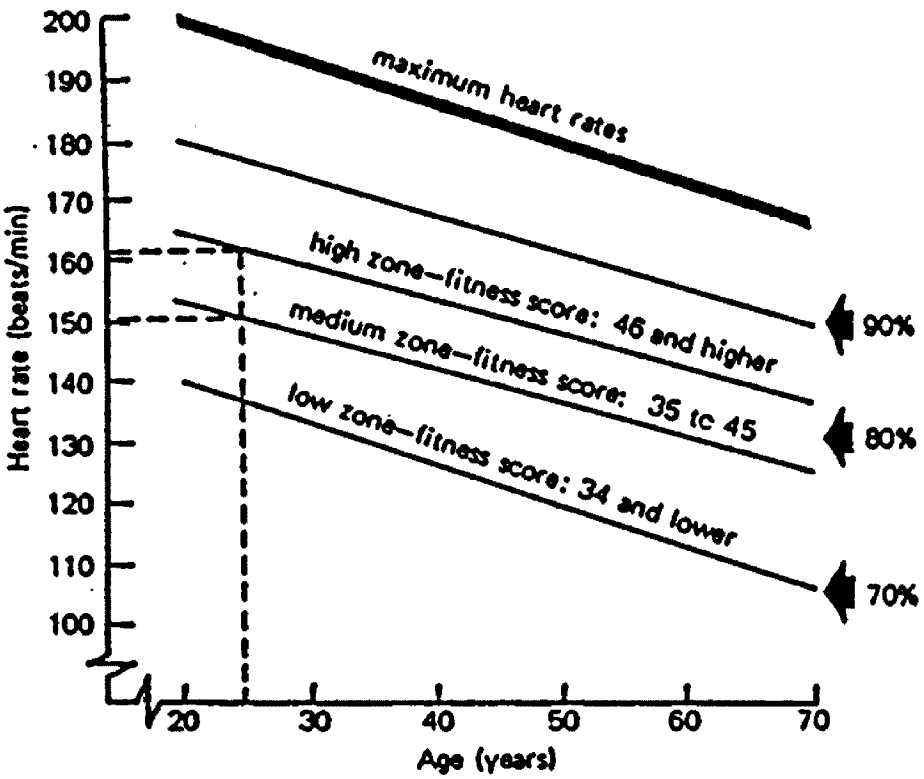


Figure 3.2 —Aerobic fitness training zones. Use your age and fitness to locate your training zone. For 25 years of age and a medium fitness score, zone = 151-162.
Note: Percentages are percent of maximal heart rate.
(From Sharkey, 1977.)

APPENDIX E

Fitness Adjustment Scale

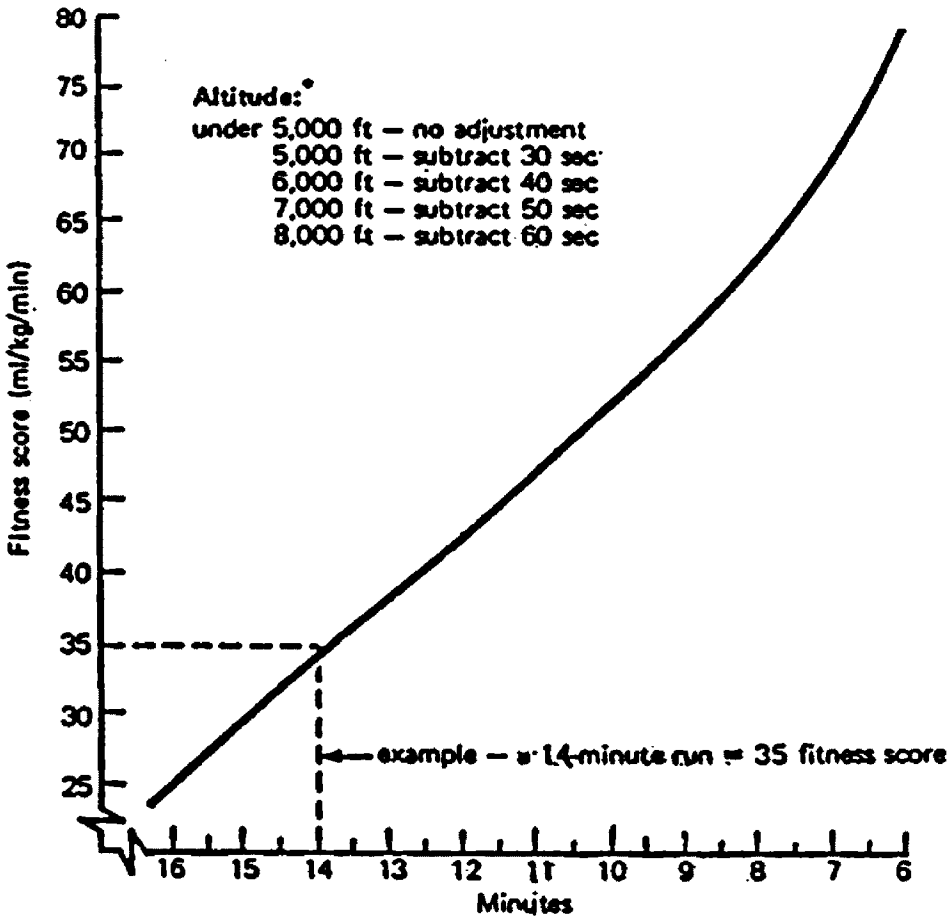


Figure B.1 —1.5-mile aerobic fitness test

*Subtract altitude adjustment from 1.5-mile run time. Then use the graph to find your score.

(Sources: Balke, 1963; Cooper, 1970; Sharkey, 1977; Daniels, Note 11.)

APPENDIX F

Physical Activity Log

During the last week, indicate the average time spent and the intensity level for all the physical activities you have participated in excluding the PHED 1115 - Fitness course.

"The easiest way to determine intensity is to check your heart rate during or just after exercise. Generally speaking, heart rates below 120 characterize LOW intensity aerobic effort; rates between 120 and 160 indicate MODERATE intensity aerobic effort; and rates between 160 and 180 indicate HIGH intensity aerobic effort." Sharkey P.11.

Try and estimate your intensity level as accurately as possible.

ACTIVITY	WEEK #1		WEEK #2		WEEK #3		WEEK #4		WEEK #5		WEEK #6		WEEK #7		WEEK #8		WEEK #9		WEEK #10		WEEK #11		
	T	INT	T	INT	T	INT	T	INT	T	INT	T	INT	T	INT	T	INT	T	INT	T	INT	T	INT	
Jogging																							
Bicycling																							
Swimming																							
Squash																							
Racquetball																							
Badminton																							
Basketball																							
Hockey																							
Calisthenics																							
Dancing																							
Football																							
Soccer																							
Tennis																							
Wrestling																							

OTHERS

T = TIME INT = INTENSITY

L = LOW M = MEDIUM H = HIGH

APPENDIX G

Individual Control Group Scores from the Health Locus of Control Scale

	Score	Post-Test Score	Score Difference
		4	0
		3	2
		7	-7
4	17	15	-2
5	13	14	1
6	12	15	3
7	7	10	3
8	18	9	9
9	9	13	4
10	16	12	4
11	6	12	6
12	19	17	-2
13	6	8	2
14	20	14	-6
15	20	21	1
16	4	6	2
17	8	7	-1
18	0	1	1
19	5	4	-1
20	15	17	2
21	26	25	-1
22	9	8	-1
23	8	2	-6
24	7	11	4
25	13	10	-3
26	15	17	2
27	8	7	-1
28	28	27	-1
29	23	20	-3
30	17	16	-1
31	-7	-5	2
32	-7	-7	0
33	9	11	2

APPENDIX H

Individual Experimental Group Scores from the Health Locus of Control Scale

Pre-Test Score	Post-Test Score	Score Difference
13	20	7
25	21	-4
3	4	1
27	24	-3
11	10	-1
7	13	4
5	11	6
3	9	6
8	18	10
14	17	3
7	16	9
20	9	-11
-8	11	19
7	7	0
-13	-6	7
14	32	18
6	17	11
13	23	10
7	2	-5
24	16	8
7	12	5
11	8	-3
13	13	0
-7	5	12
18	19	1
25	27	2
19	24	5
23	13	-10
12	9	-3
10	13	3
13	17	4
15	19	4
12	7	-5
13	16	3
20	27	7

Subject	Pre-Test Score	Post-Test Score	Score Difference
36	14	16	2
37	12	11	-1
38	8	11	3
39	15	22	7
40	11	9	-2
41	10	17	7
42	14	10	-4
43	16	21	5
44	3	10	7
45	23	23	0
46	20	23	3
47	14	15	1
48	13	16	3
49	5	17	12
50	11	3	-8
51	4	1	-3
52	21	16	-5
53	24	19	-5
54	-12	11	23
55	26	32	6
56	1	8	7
57	12	21	9
58	18	9	-9
59	9	3	-6
60	13	7	-6
61	3	11	8
62	13	9	-4
63	8	7	-1
64	1	2	1
65	1	2	1
66	7	2	-4
67	11	11	0
68	20	18	-2
69	15	12	-3

APPENDIX I

Experimental Subjects Average Weekly Activity

Time in Minutes and Intensities

Subject	Training Zone			Subject	Training Zone		
	H	M	L		H	M	L
1	126	14		36	24	144	6
2	84			37	36		84
3		60		38	63	25	
4	78	78		39		69	
5				40	63	27	
6	27	64	30	41	31	21	
7		96	264	42			90
8		20	68	43	72	288	
9		88	5	44	60	240	90
10		13	81	45	380		138
11	69	18	12	46		48	48
12	18	18	6	47	40	40	
13		41	9	48		150	72
14		24		49		144	
15		90	27	50	6	27	15
16		93	240	51	72	60	
17		69	12	52	46	30	
18	84	295		53		99	
19	132	126		54		114	
20	104	120		55	30	9	
21	20	81		56	32	25	
22	57	45	102	57	121	91	22
23	33	84	57	58		27	
24	35	48		59	30	372	
25	24	104	56	60	12	33	57
26		120		61	24	51	
27		372	60	62		108	
28	20	28		63	84	42	
29	21	28		64		38	
30	15	77		65	36	81	24
31	492	42	96	66		39	
32		24	3	67	30	27	
33	186	348		68		13	37
34	66	95		69		37	61
35		30					

APPENDIX J

Prediction of Experimental Subjects Maximal Oxygen Uptake (MV02) in (ml/kg/min) from the One and One Half Mile Run

Time in Min. & Sec.	Maximal Oxygen Uptake Prediction in ml/kg/min	Time in Min. & Sec.	Maximal Oxygen Uptake Prediction in ml/kg/min
7:45	63.75	12:30	40.5
8:00	62.5	12:45	39.5
8:15	61.25	13:00	38.5
8:30	60.0	13:15	37.5
8:45	58.75	13:30	36.5
9:00	57.5	13:45	35.25
9:15	56.25	14:00	35
9:30	55	14:15	33.75
9:45	53.75	14:30	32.5
10:00	52.5	14:45	31.25
10:15	51.25	15:00	30
10:30	50	15:15	28.75
10:45	48.75	15:30	27.5
11:00	47.5	15:45	26.26
11:15	46.25	16:00	25
11:30	45	16:15	25
11:45	43.75	16:30	25
12:00	42.5		
12:15	41.5		

APPENDIX K

Demographic Data of Experimental Subjects

Subject	Year in College	Sex	Age	Subject	Year in College	Sex	Age
1	1	F	19	36	1	M	19
2	1	F	18	37	1	M	20
3	1	F	21	38	2	M	22
4	2	F	19	39	2	M	26
5	1	F	22	40	1	M	19
6	1	F	18	41	2	M	29
7	1	F	19	42	2	M	21
8	1	F	22	43	2	M	25
9	1	F	27	44	2	M	22
10	1	F	22	45	1	M	19
11	2	F	19	46	2		23
12	1	F	20	47	1		20
13	1	F	19	48	2		
14	1	F	31	49	2		
15	1	F	28	50	1	M	
16	1	F	26	51	1	M	[illegible]
17	1	F	18	52	1	M	18
18	1	M	19	53	2	M	23
19	2	M	20	54	2	M	21
21	2	M	21	55	2	M	19
22	1	M	18	56	1	M	18
23	1	M	20	57	2	M	18
24	1	M	19	58	1	M	17
25	2	M	21	59	1	M	19
26	2	M	22	60	1	M	19
27	1	M	18	61	1	M	19
28	1	M	19	62	1	M	18
29	1	M	19	63	1	M	20
30	2	M	24	64	1	M	19
31	2	M	20	65	1	M	22
32	1	M	20	66	1	M	23
33	2	M	20	67	1	M	19
34	1	M	19	68	1	M	20
35	1	M	20	69	1	M	19

APPENDIX L

Demographic Data of Control Subjects

Subject	Year in College	Sex	Age
1	1	F	18
2	1	F	19
3	2	F	18
4	1	F	18
5	2	F	21
6	1	F	19
7	1	F	19
8	1	F	20
9	1	F	19
10	1	M	19
11	1	M	18
12	1	M	20
13	1	M	24
14	2	M	22
15	1	M	19
16	1	M	18
17	1	M	18
18	1	M	27
19	1	M	19
20	1	M	18
21	1	M	18
22	2	M	18
23	1	M	20
24	2	M	19
25	1	M	25
26	1	M	20
27	1	M	19
28	1	M	20
29	1	M	18
30	2	M	18
31	1	M	18
32	1	M	18
33	1	M	19

APPENDIX M

One and One Half Mile Pre-Test and Post-Test Results

Subject	1.5 Mile Run Pre-Test	1.5 Mile Run Post-Test	Time Difference in Seconds
1	11:47	11:59	12
2	16:06	14:06	-120
3	12:52	13:45	53
4	13:37	11:10	-147
5	13:28	11:55	-93
6	10:57	11:18	21
7	15:27	13:50	-97
8	17:10	15:40	-90
9	13:05	12:10	-55
10	13:24	11:13	-131
11	14:50	14:02	-48
12	14:13	11:42	-151
13	15:29	12:51	-158
14	10:28	12:37	-231
15	17:40	15:09	-151
16	17:40	14:57	-163
17	15:10	12:24	-166
18	8:43	8:04	-39
19	10:37	9:06	-91
20	10:22	9:56	-26
21	13:47	10:25	-202
22	10:46	8:41	-125
23	11:38	10:17	-81
24	11:12	9:08	-124
25	10:38	10:44	6
26	10:15	9:33	-42
27	10:09	9:15	-54
28	10:30	11:37	67
29	11:39	9:04	-155
30	10:10	10:17	7
31	8:34	8:30	-4
32	10:57	9:41	-76
33	8:43	8:43	0
34	8:41	8:53	12
35	11:37	10:23	-74

Subject	1.5 Mile Run Pre-Test	1.5 Mile Run Post-Test	Time Difference in Seconds
36	10:42	9:49	-53
37	10:39	11:12	33
38	11:22	10:52	-30
39	10:20	10:17	-3
40	10:57	10:07	-50
41	11:12	10:20	-52
42	11:16	11:46	30
43	9:54	9:24	-30
44	8:34	8:58	4
45	7:42	7:34	-8
46	9:10	9:00	-10
47	10:17	10:18	1
48	9:18	8:41	-37
49	10:00	9:48	-12
50	10:50	10:15	-35
51	9:32	8:59	-33
52	12:46	11:43	-63
53	11:57	10:45	-72
54	10:21	9:50	-31
55	10:40	10:05	-35
56	9:54	9:27	-27
57	10:11	9:34	-37
58	14:31	13:21	-70
59	9:37	8:46	-51
60	10:27	9:32	-55
61	10:32	9:44	-50
62	10:10	9:46	-24
63	9:12	8:47	-25
64	10:33	9:45	-48
65	11:36	9:41	-115
66	12:40	11:37	-63
67	12:06	10:40	-86
68	11:25	10:52	-33
69	11:14	10:37	-37

APPENDIX N

Aerobic Training Zones and Predicted Maximal Oxygen Uptake (MV02) Pre and Post

Subject	Training Zone	Heart Rate Training Zone	Pre-Test MV02	Post-Test MV02
1	Medium	153-165	43.75	42.5
2	Medium	140-155	25	35
3	Medium	152-164	39.5	35.75
4	Medium	153-165	36.5	46.25
5	Medium	151-163	36.5	42.5
6	High	165-180	47.5	46.25
7	Medium	140-155	27.5	35.75
8	Low	138-153	25	26.25
9	Medium	149-161	38.5	41.5
10	Medium	151-163	36.5	46.25
11	Low	140-155	31.25	35
12	Low	140-155	33.75	43.75
13	Low	140-155	27.5	39.5
14	Low	133-148	25	40.5
15	Low	134-149	25	28.25
16	Low	136-151	25	30
17	Low	140-155	28.75	36.5
18	High	165-180	58.75	67.5
19	High	165-180	50	57.5
20	High	165-180	51.25	52.5
21	Medium	152-164	35.75	50
22	High	165-180	48.75	58.75
23	Medium	153-165	43.75	51.25
24	High	165-180	46.25	56.25
25	High	164-179	48.75	47.75
26	High	163-178	51.25	55
27	High	165-180	51.25	56.25
28	High	165-180	50	45
29	Medium	153-165	43.75	57.5
30	High	162-177	51.25	51.25
31	High	165-180	60	60
32	High	165-180	47.5	53.75
33	High	165-180	58.75	58.75
34	High	165-180	58.75	60
35	Medium	153-165	45	50

Subject	Training Zone	Heart Rate Training Zone	Pre-Test MVO2	Post-Test MVO2
36	High	165-180	48.75	53.75
37	High	165-180	48.75	46.25
38	High	163-178	46.25	48.75
39	High	163-178	51.25	51.25
40	High	165-180	47.5	52.5
41	High	159-174	46.25	51.25
42	High	164-179	46.25	43.75
43	High	161-176	53.75	55
44	High	163-178	57.5	57.5
45	High	165-180	63.75	65
46	High	163-178	56.25	57.5
47	High	165-180	51.25	51.25
48	High	164-179	56.25	58.75
49	High	163-178	52.5	53.75
50	High	162-177	48.75	51.25
51	High	165-180	55	57.5
52	Medium	153-165	39.5	43.75
53	Medium	151-163	42.5	48.75
54	High	164-179	51.25	53.75
55	High	165-180	48.25	52.5
56	High	165-180	52.5	55
57	High	165-180	51.25	55
58	Low	140-155	32.5	37.5
59	High	165-180	55	58.75
60	High	165-180	50	55
61	High	165-180	50	53.75
62	High	165-180	51.25	53.75
63	High	165-180	56.25	58.75
64	High	165-180	50	53.75
65	Medium	151-163	45	53.75
66	Medium	151-163	39.5	45
67	Medium	153-165	42.5	45
68	Medium	165-180	45	48.75
69	High	165-180	46.25	50