SMOKING, AEROBIC EXERCISE, AND HEALTH LOCUS OF CONTROL

by

© David Kosinec

A Thesis Submitted in

Partial Fulfillment of the

Requirements for the Degree

Master of Arts

Department of Psychology
Lakehead University

May 1984

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

Acknowledgements

I would like to thank Dr. Jamieson for his invaluable assistance with this thesis. I would also like to thank Dr. Melnyk, my second reader, for his help. Finally, I would like to thank Dr. McLeod for his support and guidance over the past two years.

TABLE OF CONTENTS

ABSTRACT

This study examined the effect of aerobic exercise, health locus of control, and health value on smoking behavior. Thirty-eight subjects were randomly assigned to either an exercise treatment group or a self-monitoring control group. They were administered the HLC scale and a measure of health value and were instructed to use self-monitoring procedures in order to establish a smoking and exercise baseline. After the seven-day baseline was completed, the subjects in the exercise group continued to self-monitor. They also began an exercise program of steadily increasing aerobic exercise. Subjects in the control group simply continued to monitor their smoking and exercise as they did during the baseline. Following the program, the pretest measures were re-administered with the STAI and BDI added to the battery. Results indicated that the exercise group smoked significantly fewer cigarettes than the control group. No differences were found between the exercise and control groups' HLC scores, health value scores, depression scores, or state anxiety scores. However, a difference in trait anxiety scores did approach significance. These results suggest that there may be some utility in including aerobic exercise in smoking treatment programs. Possibilities for future research are discussed.

SMOKING, AEROBIC EXERCISE, AND HEALTH LOCUS OF CONTROL

Recent epidemological and biomedical research has clearly demonstrated that cigarette smoking is a serious health hazard. Researchers have linked cigarette smoking to increased risk of lung cancer, coronary heart disease, emphysema, and bronchitis (Friedman, Dales, and Ury, 1979; Cornfield et al., 1959; Horn, 1968). A 1979 U.S. Surgeon General report concluded that a causal link exists between cigarette smoking and increased health risk. Despite this information individuals begin and continue to smoke.

The smoking phenomenon is quite unusual considering the fact that most smokers accept that smoking is harmful but they still continue to smoke (Leventhal and Cleary, 1980; Horn, 1968). Despite a proliferation of smoking treatments cigarette addiction has proven to be incredibly resistant to modification (Bernstien, 1968). It has remained a pervasive phenomenon in North America in spite of the recent trends towards increased physical activity and fitness.

A relatively recent model for the modification of smoking and other addictions is the Alternative Model (Engs and Mulhall, 1978). This model suggests that involvement in recreational sports and hobbies provides a viable alternative to lifestyles characterized by addictive behaviors such as smoking. If an individual can become seriously involved in an alternative positive lifestyle the result may be a corresponding decrease in negative lifestyle behaviors (Bonneau, 1976; Biener, 1978). If a lifestyle change is necessary to reduce smoking, then a positive lifestyle

change, necessitated by adopting a program of aerobic exercise, may result in a significant smoking reduction. Aerobic exercise has received some recent consideration as a therapeutic intervention for a number of physical and psychological problems.

Aerobic Exercise as Therapy

Aerobic exercise refers to a variety of exercises that stimulate heart and lung activity for a period sufficiently long to produce beneficial changes in the body (Cooper, 1970). In recent years the topic of aerobic exercise has gained popularity among researchers. The focus of the research has been related to exercise as a means of reducing cardiovascular morbidity and as a way of improving the quality of life in normal and clinical populations (Martin and Dubbert, 1982). Much of the current research on aerobics has centered on psychological changes as in depression (Griest et al., 1979; Morgan et al., 1970), anxiety (Bahrke and Morgan, 1978; Morgan, 1980), and self-concept (Collingwood and Millet, 1971). Generally, aerobic exercise seems to have a positive influence on physical and mental health.

Despite recent interest relatively little is known about the psychological and behavioral effects of aerobic exercise (Martin and Duppert, 1982). One of the areas that has the least amount of research is the relationship between aerobic exercise and smoking behavior. Epidemiological studies have indicated that there is an inverse relationship between habitual exercise and smoking (Criqui, 1980), and there is some anecdotal evidence that smokers who begin intensive aerobic training often quit smoking (Morgan, 1981). Some research has indicated that aerobic exercise can be used effectively in the treatment of alcoholism

(Sinyor, 1982) and obesity (Stalanos, Johnson, and Christ, 1978). However, very little research has been conducted using aerobic exercise as a means of directly reducing smoking behavior. The few studies that are available have had conflicting results.

Morgan et al. (1976) conducted a mail survey of 141 adult members of a running club. Most of the members were highly fit, judging from their weekly training mileages and running times. Eighty-three had taken up running after the age of 21 and 35 of these were smoking cigarettes when they first started running. Morgan found only 3 smoking at the time of the survey, and all of these were smoking at reduced levels. Although the results of this study must be taken with some reservation, the fact that the quit rate in this sample is greater than in most standard smoking withdrawal programs is cause for interest. Morgan suggests that, "the use of aerobic conditioning in smoking withdrawal should be pursued further" (Morgan, 1976).

Taylor et al. (1973) tested the feasibility of using physical conditioning as a primary prevention for coronary heart disease. After one year of vigorous tri-weekly exercise sessions he found no difference between exercisers and controls in terms of serum cholesterol levels, blood pressure, or smoking habits. Engs and Mulhall (1981) evaluated the smoking and drinking patterns of university students both before and after a 15-week period of tri-weekly physical exercise. Subjects exercised for 40 minutes per session and were compared with a control group comprised of students involved in non-aerobic activities (i.e., archery). At the post-test there was no difference in the smoking and drinking patterns of either group.

The Alternative Model of addiction suggests that a program of aerobic exercise will reduce smoking behavior. This model assumes that individuals, overwhelmed by the stresses of daily living, turn to smoking and/or alcohol to reduce tension and anxiety. The anxiety-reducing properties of smoking have been well documented and are accepted as an important aspect of smoking maintenance (Tomkins, 1966, 1968; Leventhal, 1976; McKenell, 1968). Aerobic exercise is also known to have tension and anxiety-reducing properties (Bahrke and Morgan, 1978; Morgan, 1979, 1981). According to the Alternative Model, aerobic exercise (and its resultant tension reduction) can be an acceptable, positive, and substitutive lifestyle that can help replace a lifestyle characterized by addictive behaviors (Engs and Mulhall, 1981). Even if the dominant mechanism is not anxiety reduction, aerobics should help reduce negative lifestyle behaviors simply by keeping an individual away from people and places that promote such activities (Bonneau, Keir, and Lauzon, 1974).

The effectiveness of aerobic exercise as an intervention for smoking behavior has yet to be ascertained. The preliminary evidence is far from conclusive and needs to be augmented with further study. An important issue in this question addresses the problem of identifying individuals who will favourably respond to, and benefit from, an aerobic exercise program. It may be possible to identify individuals who are more likely to respond to such a program. Research has been conducted that supports the idea that one can predict who will benefit from smoking reduction and exercise programs.

Locus of Control

Research using Rotter's (1966) Internal-External Locus of Control Scale (I-E) has yielded some promising results in the prediction of success

in reducing smoking, drinking, and in general self-modification. The internal-external locus of control dimension measures the degree to which an individual believes that events are under his/her control (internal locus). This is contrasted to the belief that events are controlled by random or chance occurrences(external locus). The Internal-External locus of control scale (I-E scale) measures "generalized expectancies", which is the extent to which an individual perceives that one's own behavior determines one's rewards and punishments.

Many studies have reported success with linking the reduction of smoking behavior to an internal locus of control (Hjell and Clauser, 1970; Rosenbaum and Sami, 1979; Mlott, 1975; Abramson and Sequest, 1978; Scwebel and Kaemmer, 1977). Rotter's Internal-External locus of control scale has also been used successfully to predict success in weight reduction programs (Bolch, 1975), and alcohol treatment programs (O'Leary et al.,1977) Success in both kinds of programs is related to an internal locus of control. The Internal-External Locus of Control Scale seems to be functional as a predictive device that discriminates successful from unsuccessful self modifiers.

In order to test the effects of aerobic exercise on smoking, one must consider the problem of exercise adherence. This difficulty is especially salient when using exercise as a smoking therapy. Studies have indicated that smokers are far less likely to enter exercise programs than non-smokers (Massie and Shephard, 1971). If smokers do enter such a program, they are far more likely to drop out (Oldridge et al., 1975). For the

purpose of this study, it is important to attempt to identify those individuals who not only will benefit from aerobic exercise, but will also stay in the program long enough for a therapeutic effect to take place. The I-E may have some utility for this purpose.

There is some evidence that the I-E scale has utility in predicting exercise adherence. Schallow (1975) found that internally controlled subjects are better at general self-modification including exercise adherence. Sonstroem and Maxwell (1973) determined that an internal locus of control is related to, and predictive of, higher levels of physical activity and a superior fitness level. It seems that the I-E scale may have some predictive power in determining whether an individual will adhere to a number of health-related behaviors. It seems to be able to predict success in smoking reduction programs, alcohol reduction programs, and exercise adherence. All of these behaviors are health-related, and a tool specifically designed to measure locus of control beliefs relating to health has been developed.

Health Locus of Control

Rotter's I-E scale lacks a specific health focus and as a result may not be the best predictor of health-related behavior (Chavez, 1980). The Health Locus of Control Scale (Wallston, 1976) is an instrument specifically designed as a measure of expectancies regarding locus of control of health-related behavior. It has the necessary health focus and appears to have had some success in predicting smoking reduction and exercise adherence.

Wildman et al. (1979) collected health locus of control data at the beginning of a 7-week smoking reduction program stressing exercise and

self-control. By the end of the treatment, the individuals who scored in the internal direction on the Health Locus of Control Scale (HLC) were smoking significantly less than HLC externals. These group differences remained significant after a 21-month follow-up. Although the internals were regressing back to baseline levels, the externals had already returned to their baseline smoking rates.

Dishman and Ickes (1981) administered the HLC to 66 adult males who were enrolled in physical activity programs. At the end of a 20-week period the subjects were classified as exercise adherers or drop-outs. Dishman found that adherers had scores more internal than drop-outs. It seems that the HLC scale is an effective predictive device for smoking reduction and exercise adherence.

Health Value

In order to be consistent with the theory behind the locus of control construct, health value should be taken into consideration when using the HLC scale. According to social learning theory, expectancies alone should predict behavior only in situations when the values of the possible outcomes are high. As a result, when one is considering the locus of control dimension, one must control the reinforcement value or systematically take it into account (Rotter, 1966). According to Kaplan and Cowles (1978), the failure to measure health value and its possible interaction with locus of control in the prediction of behavior has resulted in an unclear relationship between smoking behavior change and locus of control. As a result, health value should be included to clarify such relationships.

Kaplan and Cowles (1978) found that individuals who held internally oriented locus of control beliefs and who valued health highly were most

successful in achieving and maintaining changes in their smoking behavior. Internally controlled subjects with a low health value had the second greatest reduction in cigarette consumption; however, their consumption increased steadily after treatment. Eventually, the high internal, low health value subjects returned to baseline levels of smoking. Conversely, the high internal, high health value subjects maintained a significantly lower level of cigarette consumption.

Witt (1978) administered the HLC and a health value measure to 33 patients who were to be discharged with a prescription for a major tranquilizer. A pill count measurement of medication compliance was taken on all subjects 10-14 days after discharge. Only a main effect for health value was found. Individuals who placed high on health value were more compliant than low health value subjects.

The results of these studies indicate the importance of including health value as a separate variable. It may account for a significant amount of variance, and it is necessary to maintain the soundness of the Internal-External locus of control concept.

Present Study

This study attempted to determine whether a program of aerobic exercise would significantly reduce smoking behavior. Previous research had suggested that aerobic exercise might be useful in treating cigarette addiction. However, the available studies were few in number and they provided conflicting results. The anecdotal studies indicated an inverse relationship between exercise and smoking, and these reports were congruent with the common-sensical notion that exercise and smoking are incompatible. Unfortunately, controlled studies were few and augmentation and clarification was considered appropriate.

The health locus of control measure was included in the study because previous research had raised the question of whether it was possible to predict success in smoking and/or exercise programs. Research had focused on using the locus of control construct for such a purpose. The HLC scale was specifically chosen because its focus was on the prediction of health-related behavior. Since exercise and smoking are health-related behaviors and previous research suggested that the HLC scale was able to predict such behavior, it was chosen as the predictive device.

A health value measure was used in order to be consistent with the health locus of control construct. It was also used in order to help clarify the relationship between smoking behavior change and health locus of control. Previous studies using the HLC scale suggested that failure to include health value was serving to obscure the HLC - smoking relationship (Kaplan and Cowles, 1978).

A self-monitoring control group was used. The choice of a self-monitoring group was made because it seemed more pragmatic to test exercise against a weak treatment rather than no treatment at all. Previous research had indicated that self-monitoring has a weak effect on smoking (Mcfall, 1970). As a result, it was chosen as the control group condition. This choice allowed expectancy effects and placebo effects to be controlled.

In order to increase the validity of the self-report measures, the "Bogus pipeline" technique was used (Jones and Sigall, 1971). This procedure involves convincing the subjects that their self-report is objectively verifiable by some physiological measure. There is some evidence that this procedure can be used effectively in enhancing self-reported cigarette consumption (Evans, Hansen, Mittlemark, 1977).

Subjects were taken from two introductory psychology classes, from the general university population, and from the general population of Thunder Bay. University students were chosen for their availability; subjects from the general populace were taken simply to maximize the sample size.

It was hypothesized that the subjects in the exercise group would decrease their smoking behavior by the greatest amount. It was also hypothesized that subjects with a high internal health locus of control and high health value scores would experience a greater reduction in cigarette consumption than externally controlled low health value subjects. They were also expected to be the most vigorous exercisers and to have the lowest drop-out rate. These expectations are due to the fact that internally controlled individuals believe that they have control over the state of their health. If they also value good health, their belief that they have control over it should motivate them to increase healthful behaviors and decrease unhealthful behaviors. Conversely, individuals who do not value good health and believe that the state of their health is controlled by chance will be less inclined to take an active effort to change it. These individuals are expected to have the smallest reduction in smoking behavior and the highest drop-out rate.

Any data derived from subjects dropping out of the study before a smoking baseline could be established was excluded from the data analysis. However, the drop-out rate was a dependent variable and was expected to be highest in the external locus of control group with a low health value.

METHOD

Subjects

Fifty subjects were recruited from an introductory psychology class as well as from the general university population, and the general population of Thunder Bay. The recruitment was done by placing an advertisement in the university student paper, and in a Thunder Bay weekly. The experimenter also recruited subjects directly from two introductory pscyhology classes. All cigarette smokers interested in exploring and/or modifying their smoking habit were invited to participate. The introductory psychology students received credit towards their final mark if they were chosen to participate in the study. Both males and females were chosen.

Of the fifty subjects recruited, 8 dropped out of the study before any baseline information could be established. These eight were excluded from the data analysis. The other 6 drop-outs were in the exercise group and dropped out after beginning training. The available data from these subjects was included in the data analysis. However, in order to increase the sample size these subjects were later replaced. This left 18 subjects in each group. There were 11 females in the control group, and 12 females in the treatment group.

Apparatus

Establishing the subject's health locus of control beliefs was done using the Health Locus of Control Scale (Wallston, 1976, see Appendix A).

Health value was determined in a manner similar to Wallston (1976). Subjects were asked to rank order nine of Rokeach's (1974) terminal values with health included in the list (see Appendix B). The position of the health value in the list was the health value score. One was an

extremely high health value; 10 was an extremely low health value.

Quantification of aerobic exercise was done using the aerobic point system (Cooper, 1976). The subjects chose their own aerobic program in consultation with the experimenter. They chose activities that interested them the most and they kept a record of the frequency and duration of such activities. They were then assigned the appropriate number of points as outlined in "The Aerobic Way" (Cooper, 1976). The Cooper point analysis of exercise intensity also provided a manipulation check for the exercise variable.

These measures were completed approximately two weeks later for the subjects recruited to replace the 6 exercise group drop-outs.

Procedure

Subjects were randomly assigned to either the control or treatment group. The six replacement subjects were randomly chosen from nine who had applied to the program after the admittance deadline had passed. They were all contacted by phone and asked to attend one of the pre-arranged meetings. They were not told about the nature of the program until they attended the first session.

At the first meeting subjects in both groups were asked to complete both the HLC scale and the health value measure. The control subjects were explained the rationale behind the smoking reduction effect of self-monitoring. In order to make this 'treatment' plausible, they were told that the act of having to do something in addition to simply taking a cigarette out of the package created a greater degree of awareness, and this awareness was sufficient to short circuit the habitual smoking pattern.

These subjects were instructed to monitor their cigarette consumption by attaching a small notebook to their packages, dividing the notebook into days and hours, and placing a checkmark in the appropriate time whenever they had a cigarette (see Appendix C). At the end of each day, the number of cigarettes were tallied and recorded in the notebook.

The control subjects were also asked to monitor their activity levels by keeping a record of the frequency and duration (including times and distances) of any recreational aerobic activity (see Appendix D). They were given a definition of aerobic activity and were told that the purpose of this procedure was to examine any possible relationships between smoking and physical activity. They were asked to report to the experimenter once per week to discuss problems and concerns and to let the experimenter record their cigarette count. All subsequent meetings were on an individual basis and lasted approximately 15 minutes. The controls were told that another group in the experiment was purposely increasing their physical activity and this was to further explore the relationship between smoking and aerobic activity.

During the first session, subjects in the treatment group were told that some evidence existed that a program of steadily increasing aerobic exercise would actually reduce one's smoking behavior. They were asked to monitor their exercise and smoking in the same manner as the control group. During a seven-day baseline period, they were asked to smoke and exercise as usual but not to attempt any radical changes in either type of behavior. At that time they gave the experimenter an idea of the type of aerobic activity or activities they might enjoy.

During the second session the experimenter completed the individualized exercise programs basing them on the subject's baseline level of

exercise (see Appendix E). Subjects were asked to follow the program as closely as possible but to report any discrepancies to the experimenter for an adjustment of aerobic point values. Subsequent meetings were on an individual basis. They were approximately 20 minutes in duration and occurred once every week. The content of these meetings consisted of program adjustments, alternative exercises, and general training advice. The experimenter was, in effect, a fitness consultant for the duration of the program.

In the seventh week of the program the subjects were exposed to the Bogus Pipeline technique. All subjects were informed that in the final session an objective measure of cigarette consumption would be taken. They were told that in order to verify their self-report a saliva swab would be taken and analyzed for its nicotine content. They were told that this test was accurate to plus or minus three cigarettes. They were also told that this test was not done previously because the machine used for such an analysis had been out of order. This deception was done in the second last week because it was assumed that after seven weeks of monitoring the accuracy of such reports might become questionable.

In the final session, after all data had been turned in and recorded, each subject was told that the machine used for the saliva analysis was again out of order. The subjects were readministered the HLC scale and the health value measure. At this time they were also administered the State-Trait Anxiety Inventory (STAI) and the Beck Depression Inventory (BDI) (see Appendix F). These tests were administered because previous research had indicated that both anxiety and depression are affected by exercise, and perceived anxiety reduction is one causal factor in cigarette smoking.

Subjects were also debriefed in the final session. They were given the details of the experimenter's hypothesis and informed of the deception regarding the saliva test. Any questions were answered at that time and subjects were thanked for their participation.

After the program the experimenter had four pre-treatment measures and seven post-treatment measures. The HLC and HV scores were obtained both before and after treatment. An exercise score consisting of the number of aerobic points per week and a smoking score consisting of the number of cigarettes smoked per week were also obtained before and after treatment. Three additional measures, state anxiety, trait anxiety and depression, were collected at the post-test only. The pretest administration of these tests was avoided in order to minimize sensitization effects.

For analysis purposes, subjects were categorized as either Internal or External depending on whether their HLC score was below or above the median of 33. Subjects were categorized as having a high or low health value depending on whether their scores were below or above the median of 3.

RESULTS

Six subjects dropped out during the exercise program. The pretest means for HLC scores, health value scores, exercise levels, and smoking levels for these subjects are presented in Table 1. T-tests comparing drop-outs with those subjects who remained in the study revealed a significant difference in baseline smoking levels, $t(40) = 3.04$, $p \leq .014$. Subjects who dropped out of the exercise program smoked less at the pretest

TABLE 1

BETWEEN-GROUP COMPARISON OF PRETEST MEANS

	Control (n=18)		Exercise (n=18)		t^1	Drop-outs (n=6)		t^2
	$\bar{x}$	s	$\bar{x}$	s	Value	$\bar{x}$	s	Value
Health Locus of Control	31.72	5.18	32.72	5.11	.582	30.83	3.9	.77
Health Value	4.05	.586	3.44	.532	.77	2.5	1.87	1.46
Exercise (Cooper Points)	.722	.411	7.0	14.82	1.78	2.5	6.12	.44
Smoking (cigarettes/ week)	132.05	60.5	115.11	15.35	.58	65.83	40.28	3.04*

*significant at .05

[1]comparing control and exercise groups

[2]comparing drop-outs to the exercise groups

than subjects who remained in the program. No other significant differences were found for the drop-outs on any of the pretest measures. Comparisons of the exercise and control group on these pretest measures indicated no significant differences (see Table 1).

The mean HLC score of the present sample ($m = 32.22$) is significantly lower ($z = 2.16$, $p < .05$) than the normative sample of young college students ($m = 34.49$; $s = 6.31$). This indicates that the subjects in the present study are slightly more internally controlled than the subjects in the normative sample.

As a manipulation check on the independent variable of exercise, a t-test was conducted on the post-test exercise score of the exercise and control group. There was a highly significant between-group difference in the number of aerobic points accrued, $t(34) = 18.05$, $p < .001$. This result indicates that the exercise group exercised at a much higher rate at the post-test than did the control group. Consequently, the treatment manipulation can be considered successful.

A three-way ANOVA was conducted in order to evaluate the effect of exercise on post-test smoking behavior. The factors in this ANOVA included: (a) treatment condition (exercise, control), (b) health locus of control (internal, external), and (c) health value (high, low). A main effect was found for exercise, $F(1,31) = 6.69$, $p = .015$. Both health locus of control, $F(1,18) = .461$ and health value, $F(1,14) = .041$, yielded no significant main effects. No significant effect was found for any of the two-way interactions or the three-way interaction. T-tests comparing changes in smoking between pretest and post-test (see Table 2) indicated a significant change in the exercise group, but no change in the control group. Thus, it appears that the exercise group showed a significant

TABLE 2

BETWEEN-GROUP COMPARISON OF POST-TEST MEANS

	Exercise		Control			
	Mean	s	Mean	s	t	p
Post Smoking	70.22*	58.017	119.72	66.343	2.38	.023
Post HLC	30.20	5.493	30.06	5.994	.06	.950
Post HV	2.66	1.98	2.82	2.157	.21	.832
Post Exercise	28.27*	6.415	.333	1.414	18.05	.000
State Anxiety	31.80	7.794	33.411	6.838	.62	.542
Trait Anxiety	32.40	6.390	36.8	6.882	1.91	.066
Depression	3.46	2.997	4.94	6.524	.84	.411

*Significant ($p < .05$) change from pretest.

reduction in smoking behavior and this effect was independent of HLC or HV scores. In addition, an analysis of covariance was conducted using the pre-treatment smoking baseline as the covariate. This analysis yielded the same results as the ANOVA (see Appendix G).

T-tests were performed on the data comparing the groups (exercise or control) on HLC changes from pretest to post-test. This analysis indicated no significant difference in the amount of change that occurred in each group's HLC scores. However, there was a significant pre- to post-test change within the treatment group, $t(14) = 3.08$, $p < .05$, that did not occur within the control group, $t(14) = .950$. The significant change in the treatment group's HLC score was in the internal direction and could reflect a change in attitude that resulted from successful self-modification.

T-tests comparing the exercise and control groups' health value changes indicated no significant difference in health value changes from pretest to post-test, $t(30) = .58$. However, there was a significant pre-post change in health value within the exercise group, $t(15) = 2.22$, $p < .05$, and within the control group, $t(17) = 2.45$, $p < .05$. This may suggest that increasing the awareness of health-related behavior may increase the value one places on health.

T-tests were done which compared the exercise and control group on post-test health value scores, post-test HLC scores, trait anxiety scores, state anxiety scores and depression scores. No significant post-test between group differences were found for health value, $t(30) = .21$, $p = .832$, or health locus of control, $t(28) = .06$, $p = .950$. Also, no significant post-test between group differences were found in depression scores, $t(30) = .80$, $p = .411$, or state anxiety scores, $t(30) = 1.90$, $p = .542$.

However, the difference in trait anxiety scores approached significance with the exercise group scoring lower than the controls, $t(30) = 1.91$, $p = .066$. This result is consistent with previous research citing exercise as a treatment for anxiety. It also provides some evidence that the exercise manipulation was having some effect.

The above ANOVA used median splits which lose information. Several correlation matrices were formed in order to compensate for this loss and discover any trends in the data that were not found in the previous analyses. The first matrix correlated all pretest scores (see Table 3). There were no significant correlations in this matrix. The second matrix correlated all post-test scores (see Table 4). This matrix found a significant positive correlation between smoking and trait anxiety, and depression and trait anxiety. A significant negative correlation was found between post-smoking and post-exercise. These correlations serve to confirm previous analyses that determined that exercise had a significant effect on smoking and anxiety scores. The correlation between anxiety and depression is to be expected. The four change scores derived from previous analyses were correlated with each other and with the post-test measures. This matrix resulted in no additional information (see Appendix H).

DISCUSSION

The primary hypothesis of this study, that aerobic exercise would reduce smoking behavior, was supported. The group that engaged in a steadily increasing program of aerobic exercise did significantly decrease their smoking when compared to a self-monitoring control group.

TABLE 3

PRETEST CORRELATION MATRIX

	Exercise	HLC	HV
Smoke	-.245 p = .149	-.07 p = .473	-.084 p = .623
Exercise	-	.043 p = .802	.093 p = .588
HLC		-	.054 p = .752

TABLE 4

POST-TEST CORRELATION MATRIX

	HV	HLC	Exercise	Stanx	Tranx	Dep
Smoke	-.159 p = .384	-.141 p = .456	- 380 p = .022	.254 p = .160	.3732 p = .034	-.003 p = .985
HV		-.003 p = .985	-.089 p = .625	.008 p = .965	.188 p = .451	.180 p = .323
HLC			-.097 p = .610	.200 p = .287	-.380 p = .038	.117 p = .535
Exercise				-.091 p = .617	- 348 p = .051	-.151 p = .407
Stanx					.627 p = .000	.188 p = .301
Tranx						.339 p = .058

The secondary hypothesis of this study was not supported. The Health Locus of Control scale and health value scores were not able to predict success in this program. They were unable to predict reductions in smoking behavior or exercise adherence and intensity.

The moderately small sample size in this study can be viewed both positively and negatively. The main effect of exercise on smoking is highly significant in spite of the small sample. This suggests that the effect is strong enough to be of practical significance. It appears that exercise may be a valuable adjunct to other treatments. Adjunct is used because, due to the health risk, complete abstinence is the ideal goal and previous research has indicated that exercise, by itself, does not produce abstinence. There certainly are exceptions to this contention. Indeed, two treatment subjects quit smoking altogether, but the majority only reduced their cigarette consumption.

Unfortunately, the failure of the HLC scale to predict exercise adherence and smoking reduction may be a result of the small sample size. Studies using locus of control measures often use larger samples to achieve significant results. The sample of the present study may simply not be large enough to detect small effects.

An important issue in a study of this nature is the accuracy of the self-report measures, both of the reported smoking and reported exercise. The validity of the smoking self-report was enhanced by the continuous tallying of cigarettes (rather than daily estimations of consumption) and the use of the Bogus Pipeline technique. Both of these procedures have been suggested as methods of enhancing the accuracy of self-report measures (Craighead, Kazdin, and Mahoney, 1981; Evans, Hasen, and Mittlemark, 1977). Their use suggests a reasonably valid self-report

measure.

The question of the accuracy of self- reported exercise is less effectively answered. Since no physiological measures were taken, changes in fitness levels cannot be used to enhance the validity of the exercise reports. However, an anecdotal report does give some support to the exercise self-report. Only three subjects in the treatment group reported that they adhered exactly to the exercise program provided by the experimenter. All others reported weekly adjustments according to weather, over-exertion, or inclination. A faking good response set would preclude these adjustments, and a faking bad response set seems unlikely given the rapport developed by the weekly interactions with the experimenter. Of the three subjects that did adhere exactly to the program, they often asked for advice on auxiliary exercises (weight training and calisthenics) and proper dress (training shoes, etc.). These subjects appeared to be the three dedicated exercisers that one might expect in a group of this nature. It did appear as is the self-reported exercise was reasonably accurate.

With any study of this type the problem of expectancy effects should be considered. The reduced smoking of the exercise group could be attributed to expectancy effects if not for one fact: the control group also had the expectancy that they were going to reduce their smoking behavior. The subjects in the control group were told that self-monitoring in the prescribed manner was an effective treatment for smoking and that they would reduce their smoking as the program progressed. As a result, any reduction due to expectancies would be reflected in the control group. Unfortunately, there is the problem of differential expectancies. If the subjects in the exercise group had expectancies to change that

were
^ much greater than the control group, this might account for some of the treatment effect. This problem is certainly inherent in the study, but it is at least moderated by the use of a control group that also expected to change.

Drop-outs in this study were divided into those who dropped out before the completion of a smoking behavior and those who dropped out after the treatment began. The overall drop-out rate was 28%. When excluding those subjects who dropped out before a smoking baseline was established, the drop-out rate decreased to 14%. The significantly lower pre-treatment smoking baseline of the drop-outs might be explained by suggesting that those subjects who smoked less came to the decision that their smoking was not a problem for them. In fact, one subject gave this as a reason for dropping out of the program. However, two out of the six drop-outs smoked at levels comparable to the mean of the exercise group, and there were subjects in both the exercise and control group who smoked at moderately low levels and did not drop out of the study. Therefore, one cannot assume that a low pre-treatment baseline is indicative of low motivation. It is unlikely that the six drop-outs from the exercise program seriously contaminated the results. The main concern with the drop-outs involves "differential attrition". If the less-motivated smokers dropped out of the exercise group and remained in the control group, then the results might be attributed to the predominance of highly motivated subjects in the exercise group. However, this does not appear to be a major problem in this study. More concern would be appropriate if the drop-outs had been heavier smokers than those who remained in the program.

The results of this study are consistent with some of the previous

research (anecdotal and experimental) that suggests that aerobic exercise has an appreciable effect on alcoholism, obesity, and smoking behavior (Sinyor, 1982; Stalanos, Johnson, and Christ, 1978; Wildman et al., 1979). It runs contrary to some research that indicates aerobic exercise is ineffective in moderating smoking (Engs and Mulhall, 1981; Taylor, Buskirk and Remmington, 1973). This discrepancy may be due to the nature of the exercise program used in these studies. The present study stressed enjoyable aerobic activities. The participants chose what aerobic activity they wanted to pursue from the many outlined in "The Aerobic Way" (Cooper, 1976). The subjects were allowed to substitute activities for the ones chosen in their program as long as they consulted the experimenter first, and kept a record of the frequency, duration and distances travelled. Presumably, the subjects found these activities enjoyable, and the incentive to continue was pleasure not stoicism. Another unique aspect of this program that may have contributed to the significant results was the frequency of exercise. In the latter stages of the program many subjects were exercising for at least four and often five thirty-minute sessions per week. This is in contrast to the tri-weekly exercised prescribed in other studies. Many subjects saw their smoking drop dramatically on the days they exercised. As a result the extended frequency gave them more smoking-free or reduced smoking days, resulting in a significant overall reduction.

Unfortunately, this study lacks a follow-up. It is impossible to tell if the subjects continued to exercise and/or smoke at reduced levels. Given the results of previous research these subjects could be expected to regress to baseline levels of smoking. However, if these subjects continued to exercise at the level suggested in the eighth week of their

program, or if they continued to increase their aerobic activity, a sustained reduction in smoking behavior seems likely. Future research could address this question.

One of the implications of these results is the possibility of using aerobic exercise as part of a holistic approach to cigarette addiction. This study indicates that there may be utility in adding aerobic exercise to the armamentarium of those involved in fighting cigarette addiction. Future research could focus on aerobic exercise as an adjunctive treatment used in combination with other behavioral treatments. Also, research using different exercise schedules might help determine if a particular pattern of exercise is more effective for treating cigarette addiction (i.e., focus exercise on times of the highest consumption). Finally, future research using the HLC scale or the I-E scale may be useful in a continuing attempt to identify those individuals who will benefit from an aerobic exercise program.

This study yielded no unexpected findings. The significant negative correlation between exercise and trait anxiety supports previous research that exercise can be used to treat anxiety (Morgan, 1979). The significant positive correlation between trait anxiety and smoking supports the notion that smoking and anxiety reduction are related (Tompkins, 1966). In combination these findings raise some interesting implications. If exercise has anxiety-reducing properties, then smokers who smoke to relieve anxiety may be able to achieve that goal through exercise rather than smoking. Tomkins (1966) suggests that teaching alternative ways of reducing negative effect may help reduce smoking in individuals who smoke for that purpose. Unfortunately, there is conflicting data in this area.

Beaver, Brown, and Lichenstien (1981) randomly assigned high and low

vations for smoking may not be congruent with smoking behavior (Adesso and Glad, 1978). Indeed, the relationship between anxiety, exercise, and smoking is quite complex and requires further study. The present study did serve to give some confirmation that anxiety and exercise are negatively related, and that smoking and exercise are also negatively related. However, inferences regarding the mechanism by which exercise affects smoking are impossible to make given the results of this study. The sorting out of this relationship can be the focus of future research.

CONCLUSION

This study found that: (a) aerobic exercise reduced cigarette consumption significantly more than self-monitoring, and (b) the HLC scale did not have utility in predicting exercise adherence or smoking reduction. Secondary findings were that exercise and trait anxiety were inversely related and that smoking and trait anxiety are positively correlated.

These resutls are consistent with some previous research that found exercise to be useful in the treatment of alcohol addiction, obesity, and cigarette smoking. These results are inconsistent with previous research that found the HLC scale to be useful in the prediction of health-related behavior, but this inconsistency may be a result of a small sample.

The significant correlations in this study are consistent with previous research investigating the relationship between anxiety and smoking, and anxiety and exercise. These correlations may also represent the underlying mechanism by which exercise helps reduce smoking.

The present study has some limitations that should be addressed in future research. First, objective measures of both fitness level and nicotine consumption would be beneficial. Also, a longer baseline to ensure that exercise and smoking behavior have stabalized would be useful. Finally, it should be recognized that the results were obtained with subjects who volunteered because they wanted to modify their smoking behavior. As a result, caution should be used in drawing inferences about the effects of exercise on smoking behavior in the general population.

REFERENCES

Adesso, V.J., Glad, W.R., A behavioral test of smoking typology. Addictive Behaviors, 1978, 3, 35-38.

Abramson, E.E., Sequest, R.C., Predicting success in a smoking control program. International Journal of the Addictions, 1978, 13, 6, 1009-1012.

Bahrke, M.S., Morgan, W.P., Anxiety reduction following exercise and meditation. Cognitive Therapy and Research, 1978, 2, 223-233.

Beaver, C., Brown, R.C., Lichenstien, E., Effects of monitored nicotine fading and anxiety management training on smoking reduction. Addictive Behaviors, 1981, 6, (4), 301-305.

Bernstien, D.A., Modifications of smoking behavior: An evaluative review. Psychological Bulletin, 1968, 88, 370-405.

Biener, K.J., The influence of health education on the use of alcohol and tobacco in adolescence. Preventative Medicine, 1977, 4, 252-257.

Bolch, P., Ross, A.W., Predicting success in weight reduction as a function of locus of control. Journal of Consulting and Clinical Psychology, 1975, 43, 119-125.

Bonneau, J.K., Keir, S., Luzon, R., Prescription: Take a daily dose. Canadian Banker and ICB Review, 1974.

Borsatta, E.F., Evans, R.R. (Eds.), Smoking, Health and Behavior. Chicago: Aldine, 1968.

Collingwood, T.R., Willett, L., The effects of physical training upon self-concept and body attitudes. Journal of Clinical Psychology, 1971, 27, 411-412.

Cooper, K.H., The New Aerobics. New York: M. Evans and Co. Inc., 1970.

Cooper, K.H., The Aerobic Way. New York: M. Evans and Co., Inc., 1976.

Cornfield, J. et al., Smoking and lung cancer: Recent evidence and a discussion of some questions. Journal of the National Cancer Institute, 1959, 22, 173-203.

Criqui, M.H. et al., Cigarette smoking and plasma high density lipoprotein cholesterol, Circulation, 1980, 62-70-76.

Dishman, R.K. Ickes, W., Self modification and adherence to therapeutic exercise. Journal of Behavioral Medicine, 1981, 4, 421-428.

Dobbs, S.D., Stickler, D.P., Maxwell, W.H., The effects of stress and relaxation in the presence of stress on urinary pH and smoking behavior. Addictive Behaviors, 1981, 6(4), 345-353.

Engs, R.C., Mulhall, P.F., Again - Let's look before we leap: The effects of physical activity on smoking and drinking patterns. Journal of Alcohol and Drug Education, 1981, 26, 371-376.

Evans, R.I., Hanse, W.B., Mittlemark, M.B., Increasing the validity of smoking reports in children. Journal of Applied Psychology, 1977, 62, No. 4, 521-523.

Frederiksen, L., Martin, E., and Webster, J.S., Assessment of smoking behavior. Journal of Applied Behavior Analysis, 1979, 12, 4, 653-664.

Friedman, G.D., Dales, L.G., and Ury, H.D., Mortality in middle-aged smokers and non-smokers. New England Journal of Medicine, 1979, 300, 213-222.

Greist, J.H. et al., Running as treatment for depression. Comprehensive Psychiatry, 1979, 20, 41-54.

Horn, D., The health consequences of smoking. In E.F. Borgotta and R.R. Evans (Eds.) Smoking, Health and Behavior. Chicago: Aldine, 1968.

Hjelle, L., Clauser, R., Internal-External control of reinforcement in smoking behavior. Psychological Reports, 1970, 26, 562-570.

Jones, E.E., Sigall, H. The Bogus pipeline: A new paradigm for measuring affect and attitude. Psychological Bulletin, 1971, 70, no. 5, 349-364.

Kaplan, G.D., Cowles, A., Health locus of control and health value in the prediction of smoking reduction. Health Education Monographs, 1978, 129-137.

Lefcourt, H.M.(ed.), Research with the locus of control construct (vol. 1). New York: Academic Press, 1981.

Leventhal, H., Cleary, P., The smoking problem: A review of the research and theory of behavioral risk modification. Psychological Bulletin, 1980, 88, 370-400.

Leventhal, H., Avis, N., Pleasure, addiction and habit: Factors in verbal report on factors in smoking behavior. Journal of Abnormal Psychology, 1976, 85, 478-488.

Martin, J.E., Dubbert, P.M., Exercise applications and promotion in behavioral medicine: Current status and future directions. Psychological Bulletin, 1982, 88, 370-405.

Massie, J.F., Shephard, R.J., Physiological and psychological effects of training - Acomparison of individual and gymnasium programs with a characterization of the exercise drop-out. Medicine and Science in Sports, 1971, 3, 110-117.

McFall, R.M., Effects of self-monitoring on normal smoking behavior. Journal of Consulting and Clinical Psychology, 1970, 35, 135-142.

McKennell, A.C., British research into smoking behavior. In E.F. Borgotta and R. R. Evans (Eds.), Smoking, Health, and Behavior. Chicago: Aldine, 1968.

Mlott, S.R., Mlott, K.D., Dogmatism and locus of control in individuals who smoke, stopped smoking, and never smoked. Journal of Community Psychology, 1975, 3, 53-57.

Morgan, W.P., Roberts, J.A., Brand, F.R., and Feinerman, A.D., Psychological effects of chronic physical activity. Medicine and Science in Sport, 1976, 2, 213-217.

Morgan W.P., Gildner, M., Wright,G., Smoking reduction in adults who take up exercise: A survey of a running club for adults. Journal of the Canadian Association for Health and Recreation, 1976, 42, 39-43.

Morgan, W.P., Roberts, J.A., Brand, F.R. and Feinerman, A.D., Psychological effects of chronic physical activity. Medicine and Science in Sport, 1979,2, 213-217.

Morgan W.P., Anxiety reduction following acute physical activity. Psychiatric Annals, 1979, 9, 141-147.

Morgan, W.P., Psychological benefits of physical activity. In F. Nagle and H. Montoye (Eds.), Exercise, Health, and Disease. Springfield, Ill.: Charles C. Thomas, 1981.

Nagle, F.J., Montoye, H.J., Exercise in Health and Disease, Springfield, Ill.: Charles C. Thomas, 1981.

Oldridge, N.B., Wicks, J.R., Hanley, C., Sutton, J.R., and Jones, N.L., Non-compliance in an exercise rehabilitation program for men who have suffered a myocardial infarction. Canadian Medical Association Journal, 1978, 118, 361-364.

O'Leary, M.R., Calsyn, D.A., Chaney, E.F., Freeman, C.W., Predicting alcohol treatment program drop-outs. Journal of Clinical Psychiatry, 1977,38, 993-995.

Rocheach, M., The Nature of Human Values. New York: Free Press, 1973.

Rosenbaum, M., Sami,A., Locus of control and success in self-initiated attempts to stop smoking. Journal of Clinical Psychology, 1979, 35, 870-872.

Rotter, J., Social Learning and Clinical Psychology. Englewood Cliffs: Prentice Hall, 1954.

Rotter, J., Generalized expectancies for internal vs. external control of reinforcement. Psychological Monographs, 1966, 80,456-465.

Schallow, J.R., Locus of control and success at self modification. Behavior Therapy, 1975, 6, 667-671.

Schwebel, A. I.,Kraemmer, W., Smoking, Alienation, and Locus of Control Factors, Omega, 1977, 8, 239-243.

Sinyor, D., Brown, T., Rostant, L., The role of physical fitness in the treatment of alcoholism. Journal of Studies on Alcohol, 1982, 43, 375-386.

Sonstroem, R.J., Maxwell, I., Relationship of attitudes and locus of control to exercise and physical fitness. Perceptual and Motor Skills, 1973,66, 1031-1034.

Stalanos, P.M., Johnson, W.G., Behavior modification for obesity: The evaluation of exercise, contingency management, and program adherence. Journal of Consulting and Clinical Psychology, 1978, 46, 463-469.

Taylor, H.L., Buskirk, E.R., and Remmington, R.D., Exercise in controlled trials of the prevention of coronary heart disease. Federation Proceedings, 1973, 32, 1623-1627.

Tomkins, S.S., Psychological model for smoking behavior. American Journal of Public Health, 1966,56, 17-20.

Tomkins, S.S., A modified model of smoking behavior. In E.F. Borgotta and R.R. Evans (Eds.), Smoking, Health, and Behavior. Chicago: Aldine, 1968.

Wallston, K.A., Maides, S.A., and Wallston, B.S., Health- related information seeking as a function of health related locus of control beliefs and health value. Journal of Research in Personality, 1976, 10, 215-222.

Wallston, K.A., Wallston, B.S., 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.

Wildman, H.E., Rosenbaum, M.S., Framer, E.M., Keane, T.M. and Johnson, W.G., Smoking cessation: Predicting success with the Health Locus of Control Scale. In H.M. Lefcourt (ed) Research with the Locus of Control Construct (vol.1). New York: Academic Press, 1981.

Witt, R., Medication compliance among psychiatric outpatients as a function of locus of control, value placed on health, and methods of patient education. In H.M. Lefcourt (ed.), Research with the Locus of Control Construct (vol. 1). New York: Academic Press, 1978.

APPENDICES

APPENDIX A

Name:_____

Age: _____

Sex: _____

Years Smoking:_____

Rating Scale

1	2	3	4	5	6
Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree

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

APPENDIX B

Below you will find a list of ten values listed in alphabetical order. We would like you to arrange them in order of their importance to YOU, as guiding principles in YOUR life.

Study the list carefully and pick out the one value which is the most important for you. Write the number "1" in the space to the left of the most important value. Then pick out the value which is second most important to you. Write the number "2" in the space to the left. Then continue in the same manner for the remaining values until you have included all the ranks from 1 to 10. Each value should have a different rank.

We realize that some people find it difficult to distinguish the importance of some of these values. Do the best you can, but please rank all 10 of them. The end result should truly show how YOU really feel.

_____ A COMFORTABLE LIFE (a prosperous life)

_____ AN EXCITING LIFE (a stimulating, active life)

_____ A SENSE OF ACCOMPLISHMENT (lasting contribution)

_____ FREEDOM (independence, free choice)

_____ HAPPINESS (contentedness)

_____ HEALTH (physical and mental well-being)

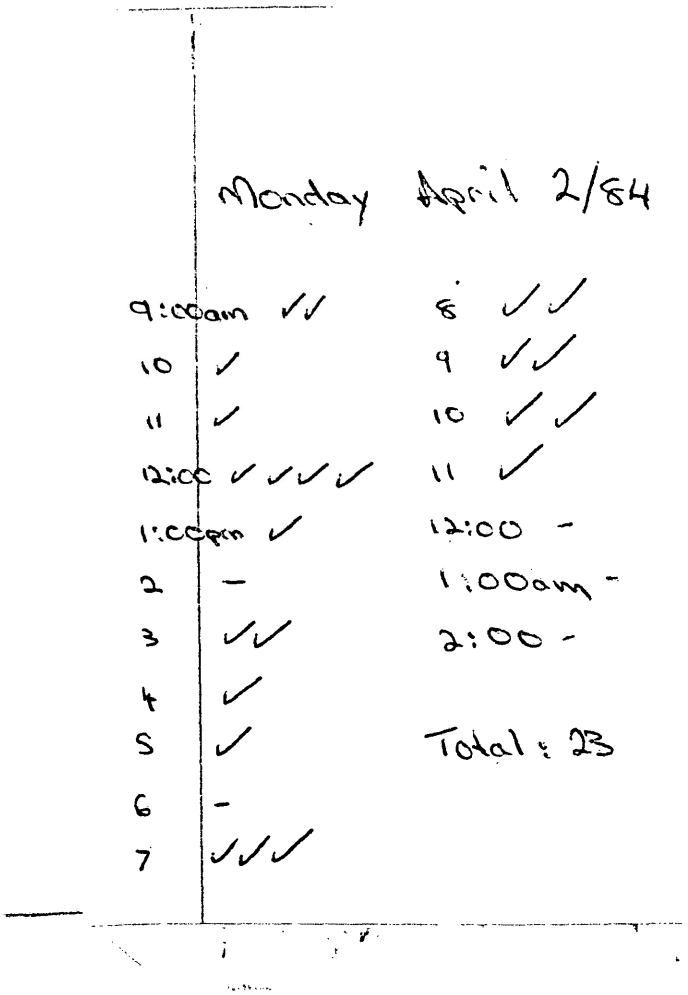
_____ INNER HARMONY (freedom from inner conflict)

_____ PLEASURE (an enjoyable, leisurely life)

_____ SELF-RESPECT (self-esteem)

_____ SOCIAL RECOGNITION (respect, admiration)

APPENDIX C


Monday April 2/84
9:00am ✓✓
10 ✓
11 ✓
12:00 ✓✓✓✓
1:00pm ✓
2 –
3 ✓✓
4 ✓
5 ✓
6 –
7 ✓✓✓
8 ✓✓
9 ✓✓
10 ✓✓
11 ✓
12:00 –
1:00am –
2:00 –
Total: 23

APPENDIX D

PERSONAL PROGRESS CHART

DATE	EXERCISE	DISTANCE	DURATION	POINTS	CUMULAT. POINTS

PERSONAL PROGRESS CHART

DATE	EXERCISE	DISTANCE	DURATION	POINTS	CUMULAT. POINTS

The Aerobics Chart Pack

1. Read all the chapters preceding this chart pack before starting into one of the following progressive exercise programs.
2. Then select one of the nine programs compatible with your age, health, and personal desires.

If you are:	Your programs are found on pages:
Under 30 years of age	95– 99
30–39 years of age	99–104
40–49 years of age	104–111
50–59 years of age	112–119
Age 60 and older	120–123

3. Remember, the time goals are to be reached at the end, not at the beginning, of the week. And if you have a problem with the requirements of the week, repeat it until that week's goals can be met.
4. When you have completed one of the age-adjusted programs, continue averaging a minimum of 24 to 30 points a week, utilizing one or a variety of different exercises. Either continue with the final program in a chosen exercise, or select one of the 30-point-per-week maintenance programs listed on pages 129–131, or develop a program of your own from the point value charts beginning on page 228.
5. Remember the objectives of aerobics is to get the required number of points per week, not to exercise in any particular way or at any particular speed or intensity. Accept the fact that your condition is good even without testing if you are averaging 24 points per week (women) or 30 points per week (men). The number of weekly points you earn correlates well with your level of physical fitness.

FITNESS CATEGORIES AND WEEKLY POINTS

	WOMEN	MEN
Very poor	< 1	< 1
Poor	1–9	1–14
Fair	10–23	15–29
Good	24–40	30–50
Excellent	> 40	> 50

< Means "less than"; > means "more than."

WALKING EXERCISE PROGRAM
(under 30 years of age)

WEEK	DISTANCE (miles)	TIME GOAL (min)	FREQ/WK	POINTS/WK
1	2.0	35:00	3	9
2	2.0	34:00	3	9
3	2.0	33:00	3	9
4	2.0	32:00	4	12
5	2.0	31:00	4	12
6	2.0	30:00	4	20
7	2.0	29:00	4	20
8	2.0	28:00	4	20
9	2.5	34:00	4	26
10	2.5	33:00	4	26
11	3.0	42:00	4	32
12	3.0 or 2.5	41:00 or 33:00	4 or 5	32 or 32.5

RUNNING EXERCISE PROGRAM *
(under 30 years of age)

WEEK	DISTANCE (miles)	TIME GOAL (min)	FREQ/WK	POINTS/WK
1	2.0	32:00	3	9
2	2.0	30:30	3	9
3	2.0	27:00	3	15
4	2.0	26:00	3	15
5	2.0	25:00	3	15
6	2.0	24:30	3	15
7	2.0	24:00	3	21
8	2.0	22:00	3	21
9	2.0	21:00	3	21
10	2.0	19:00	3	27
11	2.0	18:00	4	36
12	2.0 or 2.5	< 17:00 or < 22:00	4 or 3	36 or 34.5

* Start the program by walking, then walk and run, or run, as necessary to meet the changing time goals.

SWIMMING (CONTINUED)

TIME (hr:min:sec)	POINT VALUE
1700 Yards	
over 56:41	0
56:40–42:31	16.12
42:30–28:21	19.67
under 28:20	26.75
1750 Yards	
over 58:21	0
58:20–43:46	16.69
43:45–29:11	20.33
under 29:10	27.62
1800 Yards	
over 1:00:01	0
1:00:00– 45:01	17.25
45:00– 30:01	21.00
under 30:00	28.50
1850 Yards	
over 1:01:41	0
1:01:40– 46:16	17.81
46:15– 30:51	21.67
under 30:50	29.38
1900 Yards	
over 1:03:21	0
1:03:20– 47:31	18.38
47:30– 31:41	22.33
under 31:40	30.25
2000 Yards	
over 1:06:41	0
1:06:40– 50:01	19.50
50:00– 33:21	23.67
under 33:20	32.00
2100 Yards	
over 1:10:01	0
1:10:00– 52:31	20.63
53:30– 35:01	25.00
under 35:00	33.75
2200 Yards	
over 1:13:21	0
1:13:20– 55:01	21.75
55:00– 36:41	26.33
under 36:40	35.50

TIME (hr:min:sec)	POINT VALUE
2300 Yards	
over 1:16:41	0
1:16:40– 57:31	22.87
57:30– 38:21	27.67
under 38:20	37.25
2400 Yards	
over 1:20:01	0
1:20:00–1:00:01	24.00
1:00:00– 40:01	29.00
under 40:00	39.00
2500 Yards	
over 1:23:21	0
1:23:20–1:02:31	25.13
1:02:30– 41:41	30.33
under 41:40	40.75
2600 Yards	
over 1:26:41	0
1:26:40–1:05:01	26.25
1:05:00– 43:21	31.67
under 43:20	42.50
2700 Yards	
over 1:30:01	0
1:30:00–1:07:31	27.38
1:07:30– 45:01	33.00
under 45:00	44.25
2800 Yards	
over 1:33:21	0
1:33:20–1:10:01	28.50
1:10:00– 46:41	34.33
under 46:40	46.00
2900 Yards	
over 1:36:41	0
1:36:40–1:12:31	29.62
1:12:30– 48:21	35.67
under 48:20	47.75
3000 Yards	
over 1:40:01	0
1:40:00–1:15:01	30.75
1:15:00– 50:01	37.00
under 50:00	49.50

HANDBALL/RACQUETBALL/SQUASH/ BASKETBALL/SOCCER/HOCKEY/LACROSSE *

TIME (hr:min:sec)	POINT VALUE
under 4:59	0
5:00– 9:59	0.75
10:00– 14:59	1.50
15:00– 19:59	2.25
20:00– 24:59	3.00
25:00– 29:59	4.00
30:00– 34:59	5.00
35:00– 39:59	6.00
40:00– 44:59	7.00
45:00– 49:59	8.00
50:00– 54:59	9.00
55:00– 59:59	10.00
1:00:00–1:04:59	11.00
1:05:00–1:09:59	12.00
1:10:00–1:14:59	13.00
1:15:00–1:19:59	14.00
1:20:00–1:24:59	15.00
1:25:00–1:29:59	16.00
1:30:00–1:34:59	17.00
1:35:00–1:39:59	18.00
1:40:00–1:44:59	19.00
1:45:00–1:49:59	20.00
1:50:00–1:54:59	21.00
1:55:00–1:59:59	22.00
over 2:00:00	23.00

Note: For times greater than 2 hours, figure points at rate of 2 points/10 minutes for the time over 2 hours.

* Continuous exercise. Do not count breaks, time-outs, etc.

APPENDIX F

SELF-EVALUATION QUESTIONNAIRE

Developed by Charles D. Spielberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

STAI Form Y-1

Name _____ Date _____ S ____

Age _____ Sex: M ____ F ____ T ____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel *right* now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I feel strained	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel satisfied	①	②	③	④
9. I feel frightened	①	②	③	④
10. I feel comfortable	①	②	③	④
11. I feel self-confident	①	②	③	④
12. I feel nervous	①	②	③	④
13. I am jittery	①	②	③	④
14. I feel indecisive	①	②	③	④
15. I am relaxed	①	②	③	④
16. I feel content	①	②	③	④
17. I am worried	①	②	③	④
18. I feel confused	①	②	③	④
19. I feel steady	①	②	③	④
20. I feel pleasant	①	②	③	④

Consulting Psychologists Press
577 College Avenue, Palo Alto, California 94306

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name _____ Date _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	①	②	③	④
22. I feel nervous and restless	①	②	③	④
23. I feel satisfied with myself	①	②	③	④
24. I wish I could be as happy as others seem to be	①	②	③	④
25. I feel like a failure	①	②	③	④
26. I feel rested	①	②	③	④
27. I am "calm, cool, and collected"	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them	①	②	③	④
29. I worry too much over something that really doesn't matter	①	②	③	④
30. I am happy	①	②	③	④
31. I have disturbing thoughts	①	②	③	④
32. I lack self-confidence	①	②	③	④
33. I feel secure	①	②	③	④
34. I make decisions easily	①	②	③	④
35. I feel inadequate	①	②	③	④
36. I am content	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39. I am a steady person	①	②	③	④
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	①	②	③	④

BECK INVENTORY

Name_____ Date_____

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the PAST WEEK, INCLUDING TODAY! Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. **Be sure to read all the statements in each group before making your choice.**

1
0 I do not feel sad.
1 I feel sad.
2 I am sad all the time and I can't snap out of it.
3 I am so sad or unhappy that I can't stand it.

2
0 I am not particularly discouraged about the future.
1 I feel discouraged about the future.
2 I feel I have nothing to look forward to.
3 I feel that the future is hopeless and that things cannot improve.

3
0 I do not feel like a failure.
1 I feel I have failed more than the average person.
2 As I look back on my life, all I can see is a lot of failures.
3 I feel I am a complete failure as a person.

4
0 I get as much satisfaction out of things as I used to.
1 I don't enjoy things the way I used to.
2 I don't get real satisfaction out of anything anymore.
3 I am dissatisfied or bored with everything.

5
0 I don't feel particularly guilty.
1 I feel guilty a good part of the time.
2 I feel quite guilty most of the time.
3 I feel guilty all of the time.

6
0 I don't feel I am being punished.
1 I feel I may be punished.
2 I expect to be punished.
3 I feel I am being punished.

7
0 I don't feel disappointed in myself.
1 I am disappointed in myself.
2 I am disgusted with myself.
3 I hate myself.

8
0 I don't feel I am any worse than anybody else.
1 I am critical of myself for my weaknesses or mistakes.
2 I blame myself all the time for my faults.
3 I blame myself for everything bad that happens.

9
0 I don't have any thoughts of killing myself.
1 I have thoughts of killing myself, but I would not carry them out.
2 I would like to kill myself.
3 I would kill myself if I had the chance.

10
0 I don't cry any more than usual.
1 I cry more now than I used to.
2 I cry all the time now.
3 I used to be able to cry, but now I can't cry even though I want to.

11
0 I am no more irritated now than I ever am.
1 I get annoyed or irritated more easily than I used to.
2 I feel irritated all the time now.
3 I don't get irritated at all by the things that used to irritate me.

12
0 I have not lost interest in other people.
1 I am less interested in other people than I used to be.
2 I have lost most of my interest in other people.
3 I have lost all of my interest in other people.

13
0 I make decisions about as well as I ever could.
1 I put off making decisions more than I used to.
2 I have greater difficulty in making decisions than before.
3 I can't make decisions at all anymore.

14
0 I don't feel I look any worse than I used to.
1 I am worried that I am looking old or unattractive.
2 I feel that there are permanent changes in my appearance that make me look unattractive.
3 I believe that I look ugly.

15
0 I can work about as well as before.
1 It takes an extra effort to get started at doing something.
2 I have to push myself very hard to do anything.
3 I can't do any work at all.

16
0 I can sleep as well as usual.
1 I don't sleep as well as I used to.
2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3 I wake up several hours earlier than I used to and cannot get back to sleep.

17
0 I don't get more tired than usual.
1 I get tired more easily than I used to.
2 I get tired from doing almost anything.
3 I am too tired to do anything.

18
0 My appetite is no worse than usual.
1 My appetite is not as good as it used to be.
2 My appetite is much worse now.
3 I have no appetite at all anymore.

19
0 I haven't lost much weight, if any, lately.
1 I have lost more than 5 pounds.
2 I have lost more than 10 pounds.
3 I have lost more than 15 pounds.
I am purposely trying to lose weight by eating less. Yes_____ No_____

20
0 I am no more worried about my health than usual.
1 I am worried about physical problems such as aches and pains; or upset stomach; or constipation.
2 I am very worried about physical problems and it's hard to think of much else.
3 I am so worried about my physical problems that I cannot think about anything else.

21
0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

APPENDIX G

ANALYSIS OF VARIANCE ON POST-SMOKING

Source of Variation	Df	Mean Square	F	Significance of F
HLC	1	1312.685	.343	.563
HV	1	3256.271	.850	.364
Group	1	25574.906	6.679	.015
HLC HV	1	2726.123	.712	.406
HLC Group	1	3250.646	.849	.365
HV Group	1	9.362	.002	.961
HLC HV Group	1	12676.348	3.310	.080
Residual	28	3829.360		

ANALYSIS OF COVARIANCE OF POST-SMOKING USING

PRE-SMOKING LEVEL AS THE COVARIATE

Source of Variation	Df	Mean Square	F	Significance of F
Pretreatment Smoking	1	90746.875	49.813	.000
HLC	1	840.365	.461	.503
HV	1	75.199	.041	.841
Group	1	11553.527	6.342	.018
HLC HV	1	798.764	.438	.513
HLC Group	1	293.865	.161	.691
HV Group HLC	1	933.996	.513	.480
Residual	27	1821.744		

APPENDIX H

CHANGE SCORE CORRELATION MATRIX

	Group	Smoke Ch.	HV Ch.	HLC Ch.	Exercise Ch.
Group		.383 p = .021	-.103 p = .574	.1450 p = 444	-.260 p = .125
Smoke Change			-.1786 p = .328	.2431 p = .116	-.260 p = .125
HV Ch.				.1468 p = .439	.209 p = .250
Exercise Ch.				-	-.157 p = .406