THE ROLE OF SELF-EFFICACY IN PREDICTING
ADHERENCE/COMPLIANCE TO HEALTH BEHAVIOR REGIMENS

DISSERTATION

Presented to the Graduate Council of the
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Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

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The purpose of the present study was to investigate the relationship between Self-Efficacy Theory (Bandura, 1977) and adherence to health behavior prescription. A self report Self-Efficacy Questionnaire was developed to assess levels of efficacy. Dietary adherence was determined by self report as well as body composition assay and measurement of body weight. Levels of exercise compliance were assessed by self report in addition to a treadmill test.

Twenty-five male and 42 female subjects were recruited from the Aerobics Center/DISD Stress Management/Wellness Program. These subjects were randomly assigned to one of four groups. Group I received the self-efficacy measure pre- and post-treatment. Group II received the self-efficacy instrument pre-treatment only. Group III received the measure post-treatment. Group IV served as a control and did not receive the measure.

It was hypothesized that measurement of self-efficacy would not influence adherence and that measurement of efficacy would not influence measurement of efficacy post-treatment. Additionally, it was hypothesized that levels of pre-treatment efficacy would be related to levels of adherence and that adherence would raise levels of efficacy.
Statistical results indicated that measurement of efficacy did not influence performance in the program, nor did pre-treatment assessment of efficacy affect measurement of post-treatment efficacy. There was no correlation found between levels of pre-treatment efficacy and levels of compliance. Finally, there was a strong significant relationship between success in the program and an increase in self-efficacy.
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THE ROLE OF SELF-EFFICACY IN PREDICTING
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As has been noted in numerous publications in a wide variety of fields, there are significant benefits to be derived from health related behaviors such as regular aerobic exercise and good dietary habits. Among the benefits most noted are those of reduced cardiovascular risk, and the enhancement of the quality of one's life (Martin & Dubbert, 1982). Exercise has been extensively employed in programs designed to prevent or treat coronary heart disease by improving cardiovascular efficiency and by modifying cardiovascular risk profiles in apparently healthy patients, in high risk patients, and in coronary patients (Martin & Dubbert, 1982). Similarly, compliance with prescribed dietary regimens is an important factor in the prevention of cardiovascular diseases and other chronic health problems, such as diabetes mellitus, arthritis, and kidney failure (Glanz, 1980). Nutritional factors that have been shown to increase one's risk for developing these illnesses include obesity and the over consumption of sugar, salt, and fat (Glanz, 1980). There is an ever increasing body of evidence suggesting that nutrition behavior is reflected in the health status of populations and that proper nutrition promotes good health (Glanz, 1980).
Though these potential physiological benefits have been well documented, there has been considerably less attention and research devoted to the potential psychological gains to be derived from regular exercise and proper diet. Several investigations which have directly addressed this area are particularly noteworthy.

Collingwood & Willet (1971) demonstrated that physical training positively affected the self-attitudes of their subjects by providing growth and success experiences for them. As the authors pointed out, better self-attitudes are the goals of most psychotherapeutic processes and physical training may provide an important, facilitative mode for achieving this goal.

Other studies have shown that in addition to the known physical benefits of regular exercise for cardiac patients (e.g., reductions in the plasma triglycerides and LDL cholesterol and increases in the protective HDL cholesterol; decreases in resting and active heart rate and blood pressure; and increases in stroke volume and oxygen utilization), exercise is also beneficial in that it promotes the psychosocial rehabilitation of these patients (Martin & Dubbert, 1982). This is very important since psychological recovery is often quite slow for those patients who avoid the physical exertion and recreational activities which they had previously enjoyed, thus preventing themselves from leading full and productive lives (Bandura, 1982). Research has shown that
early and sustained physical activity is associated with shorter hospitalization and a more complete return to work. The latter has been shown to relate to increased survival rate (Wenger, 1978, 1979).

Other researchers have demonstrated exercise-mediated psychological changes such as decreases in depression (Crist, Klein, Eischens, Gurman & Morgan, 1979; Morgan, Roberts, Brand & Feinerman, 1970), and decreases in anxiety (Bahrke & Morgan, 1978; Morgan, 1979, 1981; de Vries, 1981). The way in which physical exercise leads to these psychological benefits is not yet understood, but the apparent anti-depressive and anti-olytic effects of aerobic exercise are currently a topic of great interest (Sacks & Sachs, 1981). Changes in monoamine levels (Dimsdale & Moss, 1980), liberation of beta-endorphins (Apenzeller, Standefer, Apenzeller & Atkinson, 1980), and the creation of a "positive addiction" to exercise (Apenzeller, 1981; Glasser, 1976) have all been proposed as explanations for the positive psychological effects of regular exercise. Similarly, participants in weight loss programs are often found to be socially motivated to achieve weight loss (Glanz, 1980) suggesting that there are important psycho-social benefits to be derived from proper diet and the maintenance of appropriate weight.

Of a more general psychological nature, and of interest to providers of health services at almost every level, is the overwhelming evidence that despite the known benefits
of regular exercise and proper diet, most people either fail to undertake or fail to adhere to regular health-related regimens. Surveys have indicated that about two-thirds of Americans do not exercise regularly (Harris Poll, 1978a, 1978b), and 45 percent may not exercise at all (Buchner, 1974). Furthermore, though most people fail to undertake regular exercise programs, of those who do begin exercising, a very large percentage tend to drop-out within a short period of time, often within the first six weeks (Olderidge, 1982). Adult fitness programs have typically reported adherence rates of only 40-65 percent, indicating quite a substantial drop-out rate (Dishman, 1980). On the other hand, some studies have indicated that rates of adherence sharply rise for those participants who stay with a program for longer than three months (Martin, 1981). Stunkard (1981) reports that no more than 50 percent of patients adhere to long-term treatments with prescribed diets and rates as low as 20 percent have been reported in the treatments of obesity and hypertension. Although the rate of dietary non-compliance is extremely high in most reports, there has been some criticism of the available data. Glanz (1980), for instance, stated that much of the diet compliance data is of poor quality and is difficult to interpret. In general, however, results of studies of dietary compliance with weight reduction regimens tend to be discouraging, and studies of diet non-compliance for cardiovascular disease
have reported compliance rates are as low as 13 percent (Glanz, 1980).

Recent studies have attempted to determine why people either fail to begin or fail to adhere to regular health-promoting behavior regimens. Stunkard (1981) stated that concern for adherence is long overdue because of the increased effectiveness of many treatments which are now available. Furthermore, Glanz (1980) pointed out that health care professionals should be concerned because non-compliance has a detrimental effect on the overall quality of available medical care. This detrimental effect occurs through unsuccessful curative and preventative therapies, through the negative effects this may have on the therapeutic relationship; and through general dissatisfaction with medical care. Non-compliance also often has detrimental effects on medical science by threatening the validity of clinical trials of new treatments (Glanz, 1980).

In a review of the literature concerning compliance with exercise programs, Olderidge (1982) summarized the major characteristics and reasons for volunteering, complying, and dropping out of such programs. Volunteer characteristics included: living or working near the exercise center, having white collar occupational status, and being active in one's leisure time. Drop-out characteristics were smokers, those who were inactive in their leisure time, and those whose spouse was neutral or negative towards the individual's participation.
in the exercise program. The primary reasons for dropping out included the inconvenience of the program, transportation difficulties, psycho-social problems (e.g., family discord), and medical reasons. Finally, reasons for compliance included health benefits increased the participants' self-confidence, the social aspects of participation, and spouse encouragement. In his studies of exercise compliance, Dishman, et al. (1981) found that percent body fat, actual body weight, and "self-motivation" (as measured by a scale they developed) were also discriminating factors between drop-outs and adherers to exercise programs.

Non-compliance is not a problem which is unique to the realm of exercise and diet program participation. As Blackwell (1979) pointed out, medical compliance became an important issue in the 1970s when health care providers became aware that even highly effective drugs are useless if they are not taken. He drew attention to psycho-social factors such as the attitudes, beliefs, and social predicaments of the patient, and the influential role these factors play in health and illness-related behavior (Blackwell, 1979). Similarly, in his review of medical treatment adherence, Stunkard (1981) found that adherence is often determined by the social context in which the illness and the treatment occur, as well as by specific features of the treatment regimen itself. The complexity of the regimen is important, for
instance, particularly as it relates to the extent to which
the patient understands the physician's instructions (one-
half to two-thirds may not). The duration of the regimen
is important also since it has been found that longer
treatment programs often lead to poorer adherence. Family
support and satisfaction with one's physician are other
factors which relate to adherence to treatment (Stunkard,
1981). These are all important findings to consider since
many people enter exercise and weight loss programs on the
advice of their physician and for health reasons, but then
fail to follow the treatment plan for reasons unrelated to
health concerns.

A number of studies have searched for demographic
features (e.g., age, sex, education, SES level) which are
predictive of compliance, but thus far few consistent
relationships have been found (Glanz, 1980). Furthermore, as
Stunkard (1981) pointed out, findings of correlation between
such factors as social class and adherence can often be
explained on the basis of underlying variables such as
education level and comprehension of the therapeutic regimen.

As the above mentioned studies would suggest, most of
the attempts to understand adherence thus far have been of
a highly empirical nature guided by a minimum of theoretical
concerns (Stunkard, 1981). Dishman, for instance, has
proposed a formula for predicting exercise adherence which
takes into account self-motivation as measured by the self-motivation questionnaire developed by Dishman, Ickes & Morgan (1980); the body weight of the individual; and his/her percent body fat. Individuals who receive predicted scores of ten or less as computed by Dishman's formula fall into the "drop-out prone" category. By identifying these individuals from the outset of an exercise program, it is proposed that they can be prevented from dropping out. Strategies for preventing drop-out are not discussed, however (Morgan, 1980).

The more theoretical approaches to program development and prediction of adherence which have been cited in the literature have generally been of two types—applied behavioral analysis and the health belief model (Stunkard, 1981). Applied behavior analysis has been defined as "the process of applying principles of behavior to the improvement of specific behaviors, and simultaneously evaluating whether or not any changes are attributable to the process of application" (Baer, Wolf & Risley, 1968, p. 43). The application of behavioral technologies to exercise participation is relatively new (Martin, 1981). It has, however, been used quite extensively in the treatment of obesity, including about 100 controlled clinical trials of behavioral treatments of obesity (Stunkard, 1981). As with behavioral approaches to other problems, the antecedents and consequences
of health-related behaviors are of utmost importance in programs of this sort.

In looking at behavioral treatment paradigms, one can readily categorize studies according to the primary controlling variables which were targeted. These variables include stimulus control, reinforcement control, and cognitive/self-control (Martin & Dubbert, 1982).

Control of the antecedents of a target behavior (stimulus control) has been the goal in some exercise studies and in many studies of the treatment of obesity. Some examples of stimulus control for eating behaviors include removing food from sight, keeping high calorie foods out of the house, having fresh vegetables prepared to snack on, and selecting a "designated eating place" (Stunkard, 1981, p. 12). Examples of stimulus (or antecedent) control over physical activity are telephone prompts to health club drop-outs (Wankel & Thompson, 1977) or a cartoon placed by an escalator/stairway encouraging use of the stairs instead of the escalator (Brownell, Stunkard & Albaum, 1980).

Reinforcement control, or control over the consequences of a behavior, is another behavioral strategy often employed. Following Skinner's assertion that behavior is maintained by its consequences, the main assumption underlying all behavioral treatments is that we tend to persist in a behavior for which we are rewarded, and we tend to stop behaviors for which we are
punished or for which there are no consequences. Unfortunately, many of the rewards of health-related behaviors are only apparent in the long term and are therefore not as reinforcing as the immediate pleasure derived from such behaviors as relaxing at home or eating high calorie foods. Furthermore, the immediate aversive consequences that most people experience when first beginning an exercise program or a restricted diet often leads to abandonment of the healthy behavior before positively reinforcing consequences (such as decreases in percent body fat or lowered blood pressure) are ever experienced. For this reason, rapid reinforcement of target behaviors with points, contracting, lotter procedures, and individualized feedback and praise during exercise have all been employed with some success in reinforcement control paradigms (Martin & Dubbert, 1982).

A third behavioral strategy, cognitive/self-control, employs self-management techniques to modify target behavior. Self-contracting, goal-setting, self-reward, record keeping, and self-monitoring procedures are all examples of cognitive/self-control techniques. Self-monitoring was first instituted not as a treatment strategy, but rather as a means for obtaining information with which to construct individual treatment programs. It has been found to have an independent positive effect on target behavior, however, and is now often used as a treatment technique itself.
Despite the findings that these and other behavioral procedures are often effective, the benefits appear to be temporary for most people (Martin & Dubbert, 1982). Few programs have focused on the maintenance of health-related behavior and as was discussed earlier, drop-out rates are consistently very high. Many of the behavior analysis strategies may fail in the long run because they employ external controls to achieve their ends, and once these controls are removed (e.g., the program ends) other factors (time expenditure, inconvenience, etc.) may become more salient and decrease an individual's commitment to the health program. It would appear that external controls are very poor predictors of adherence and that from a theoretical point of view, the strictly behavioral approach of controlling antecedents and consequences of behavior is lacking in its ability to increase adherence to health-behavior programs. With the behavioral approach we seem to be no closer to being able to increase long term adherence or to predicting adherence to health-behavior regimens except to say that an individual will adhere to a program if it is reinforcing to do so.

A second theoretical approach to the study of adherence is the "Health Belief Model" which was formulated in 1966 by I. M. Rosenstock. The Health Belief Model is a model of decision making in personal health-related behaviors. It proposes that an individual's behavior is related to his/her
subjective perceptions of a health threat and to his/her evaluation of actions recommended to reduce the threat. Thus, adherence to a health behavior regimen depends on one's subjective beliefs about one's own health, particularly belief in one's susceptibility to illness, and one's belief about the value of the proposed treatment (Stunkard, 1981). Perceived barriers to taking preventive action are also considered; some of these are the cost, the discomforts, and the inconvenience of the treatment.

Taylor, Sackett, and Haynes (1978) conducted a study of adherence to antihypertensive regimens using the Health Belief Model. After a six-month period they found a weak correlation between subjects' health beliefs during screening and actual therapy adherence. They measured health belief again at this time and then found a strong correlation between beliefs and adherence during the second six-month period of treatment. It appears that changes in health beliefs correlated with changes in adherence, suggesting that the Health Belief Model can facilitate interventions to improve adherence and that the model is most useful after an individual has had experience with the treatment (Stunkard, 1981). In another important test of the Health Belief Model, Hershey, et al. (1980) found that most of the variance in adherence to antihypertensive medication could be accounted for by only three components of the model and that three
other components failed to predict adherence at all. Thus, perceived control over health matters, perceived barriers and duration of treatment predicted 76 percent of the variance; and perceived susceptibility, perceived severity, and perceived benefits failed in prediction. Similarly, Berman (1975) found that patients involved in weight loss programs often do not emphasize the medical aspects of being overweight as strong motivators for reducing. Young dieters especially are more strongly motivated by social factors than they are by health factors. Thus, for the large number of dieters who are not primarily concerned with health risks, the Health Belief Model may be inadequate for predicting or explaining dietary compliance.

Though the Health Belief Model yields valuable information about an individual's perceptions of and attitudes toward his/her health status, it does not seem to tap a reliable source of information about an individual's willingness to engage in and persist in actual health-promoting behaviors. Thus, the model appears to be inadequate for predicting adherence as well as for suggesting methods for improving adherence.

Now will be described a third model for understanding and predicting an individual's willingness to engage in health-related behaviors. It is derived from Bandura's Social Learning Theory, and it employs his constructs of
self-efficacy and outcome expectations. As will be shown, this model differs from the behavioral model in that adherence is not predicted by external events (contingencies and reinforcements), and it differs from the Health Belief Model in that it does not focus on one's beliefs about health per se, but on beliefs about oneself. Social Learning Theory provides a model for understanding the mechanisms of behavior change and it may be used to account for the differential success of various behavior change techniques (Kazdin, 1979).

According to Social Learning Theory, behavior change is mediated through cognitive processes. A growing body of theory and research points to the influential role that cognitive processes have upon one's behavior, and of particular interest is the highly influential role played by self-referent thoughts or one's thoughts about oneself (Bandura, 1982). Bandura (1977) proposed that self-referent thought is that which mediates the relationship between knowledge and action. He noted that self-efficacy is important but it is not the sole determinant of behavior since an individual's expectations of self-efficacy will not produce behavior if the individual does not possess the appropriate skills and motivation for performance (Bandura, 1977). Subjective evaluations of one's skill level, on the other hand, will predict one's willingness to participate in an activity and this is true regardless of the objective accuracy of one's self-appraisal. Thus, how people judge their capabilities strongly influences
their subsequent behavior (Bandura, 1982). Furthermore, the distinction between self-efficacy and outcome expectations are important. Efficacy expectations refer to an individual's judgment of whether he/she can perform the particular behavior, and outcome expectations refer to whether the individual believes that once the behaviors are performed that certain outcomes will follow (Bandura, 1977). Self-efficacy and outcome expectations are differentiated since an individual can come to believe that a particular course of action will produce desired outcomes, but still question whether they can perform the requisite actions (Bandura, 1977). Furthermore, the strength of a person's beliefs in their own effectiveness will not only influence whether they will attempt to cope with difficult situations, but these beliefs will also determine how much effort the person will expend and how long he/she will persist in the face of obstacles and aversive experiences (Bandura, 1982).

Clearly, Bandura's self-efficacy theory appears to be relevant to the problem of adherence/compliance. It suggests both a theoretical framework for understanding the problem as well as a methodology for improving adherence to health-behavior regimens. Furthermore, the successes achieved by the two previously discussed models can be explained by self-efficacy theory and those models can be subsumed by the self-efficacy model.
Bandura's Social Learning Theory goes beyond applied behavior analysis by proposing that it is essential to take into account an individual's cognitive experience if one is to be successful in achieving lasting behavior change. Social Learning Theory does not dismiss the importance of the behavior changes techniques proposed by applied behavior analysis for these techniques provide us with valuable tools by which we can raise a person's level of self-efficacy and thus increase the likelihood of long-lasting behavior change. Through the application of immediate reinforcement for gradual performance improvements, for instance, we can raise an individual's sense of self-efficacy as he/she experiences success with the target behavior.

Similarly, the aspects of the Health Belief Model which are valuable in predicting adherence may also be subsumed by the self-efficacy model. As was discussed earlier, Bandura distinguishes between one's confidence in his/her ability to perform a particular task (self-efficacy) and one's confidence that successful performance of the task will lead to a desirable outcome (outcome expectations) (Bandura, 1977). The Health Belief Model, on the other hand, addresses the effect on behavior of outcome expectations but fails to adequately address self-referent thoughts. This may explain why Taylor, Sackett, and Haynes (1978) found that changes in health beliefs only correlated with
changes in adherence after individuals had experience with the treatment regimen. Self-efficacy theory suggests that this model was most useful after an individual had experience with the treatment because that experience increased the subjects' expectations that adherence to the treatment would lead to a desirable outcome. In other words, the individuals' outcome expectations had been raised. It is also possible that after participating in the program the individuals experienced increased confidence in their own ability to improve their health, i.e., increased self-efficacy.

Statement of the Problem

While personal beliefs or knowledge about health matters are important, this cannot explain the extremely high nonadherence rates which have been reported. The benefits of physical activity and proper nutrition are widely known and often are the expressed purpose of undertaking health-promoting activities. Thus, it is still unclear why people often fail to undertake or persist in these healthy pursuits.

Purpose

It is possible that most people are aware of the benefits to be derived from proper nutrition and regular exercise (i.e., have positive outcome expectations), but that they are not confident enough in their own ability to undertake and persist in those behaviors until they are apparent and reinforcing to them. In short, low self-efficacy or lack of confidence in oneself may lead to nonadherence to health behavior.
regimens. By studying self-efficacy it may be possible to predict from the very outset of a program who will fail to adhere and what interventions would be the most successful in promoting better adherence.

**Hypotheses**

**Hypothesis 1.** It was hypothesized that measurement of self-efficacy would not influence adherence.

**Hypothesis 2.** It was hypothesized that measurement of pre-treatment self-efficacy would not affect measurement of post-treatment self-efficacy.

**Hypothesis 3.** It was hypothesized that there would be a positive relationship between levels of pre-treatment self-efficacy with levels of adherence.

**Hypothesis 4.** It was hypothesized that adherence would increase self-efficacy.

**Method**

**Subjects**

The subject population for the project came from the Aerobics Center/Dallas Independent School District Stress Management/Wellness Program. The participants in the program were educators employed by the Dallas Independent School District (DISD). Cost of the program was borne by the DISD. The sample included 67 subjects, 25 male and 42 female, with an average age of approximately 41 years as shown in Table 1 (Appendix A). These individuals enrolled in the program in order to learn about and increase their participation in health related behaviors. In so far as all educators
employed by the DISD had the option to join, it was assumed that those who did enroll had positive outcome expectations. The program sequence was structured and included medical screening, fitness assessment, individual counseling to set goals and to recommend specific health prescriptions, weekly group educational/exercise meetings, and feedback systems designed to help motivate the participants. The program was 14 weeks in length, from pre-testing to post-testing. For a detailed description of the program, see Appendix B. The program was developed and administered by the Division of Continuing Education of the Institute for Aerobics Research at the Aerobics Center. It is important to note that the program administrators placed extensive limitations on the experimenter's access to the subject population. Specifically, this meant that direct measurement of outcome expectations was not possible, nor was it possible to use adherence data other than that already being collected by the Division of Continuing Education. The one exception to these limitations was that, by mutual agreement, any adherence data necessary to the study and not already being collected by the program staff could be assessed by the experimenter.

**Instruments**

For the purpose of the study, a self-report measure of self-efficacy was developed. The measure required the participants to rate, on a seven point scale, their confidence in their ability to adhere to certain health-related behaviors.
The points on the scale ranged from "not at all confident" (1) to "extremely confident" (7) (see Appendix C). Similar face-valid questions for assessment are the same type format as that used by Bandura, in addition to other self-efficacy researchers, as reported in the literature. A pilot investigation was undertaken, with a population similar to the one in the study, which derived a split-half reliability factor of .96 for the self-efficacy instrument (see Appendix D).

In the literature the terms "adherence" and "compliance" are used interchangeably. Such was the case for this study. Each participant in the wellness program received a health prescription to which they could adhere/comply, or not. For the purpose of this study, the dependent variables regarding the subject's level of success or failure were operationalized on each of the measures listed below.

The Dietary Adherence Questionnaire was a face-valid post-treatment self-report instrument asking the subject to rate on a seven-point scale how adherent he/she had been since entering the Wellness Program (see Appendix E). There was not a standard for compliance, but rather levels of adherence were derived by this measure. This instrument was unique in that it was the only adherence measure developed by the experimenter.

The Exercise Adherence Questionnaire was administered pre- and post-treatment. It involved the individual rating, on a seven-point scale, how active they perceived themselves
to be, relative to members of their own sex and age group (see Appendix F). This measure allowed for assessment of levels of exercise adherence, as well as operationally defining those who had a positive change score as being "compliant," and those who remained at the same level or had a negative change score, to be classified as "noncompliant."

The **number of miles jogged per week** was assessed pre- and post-treatment by asking each participant to indicate number of days jogged and average miles jogged on those days. Each participant's pace was determined by individual prescription i.e., percentage of maximum heart rate. This data was gathered to identify levels of jogging adherence.

**Treadmill time** was recorded pre- and post-treatment with a positive change in time being operationally defined as adherence with exercise prescription. It also afforded an opportunity to test the validity of the self-report exercise measures. The technique used to gather the data was a modified Bruce protocol (see Appendix G).

**Body weight** was recorded pre- and post-treatment. Adherence was operationally defined as a loss of body weight.

**Percentage of body-fat** was collected pre- and post-treatment. Adherence was operationally defined as a loss in percent body-fat. The Pollock-Jackson formula was used to determine percent body fat using skin-fold calipers. Assessment sites on men were on the chest, abdomen, and thigh.
Assessment sites on women were the triceps, supra illiac, and thigh.

Procedure

The program had three activity centers located about the city at which the weekly group activities, including pre- and post-testing occurred. Participants chose the center which was most convenient for their attendance. When the subjects first arrived at the centers they were randomly assigned to one of four groups for the study. Those who received the self-efficacy instrument did so prior to any experience with the program, including physiological measures. The groups were as follows. **Group I** received the self-efficacy instrument pre-treatment as well as post-treatment. **Group II** received the self-efficacy measure pre-treatment only. **Group III** received the self-efficacy measure post-treatment only. **Group IV** did not receive the self-efficacy measure at any time.

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*Data collected for all subjects on all Adherence measures. N = 67.

**Figure 1.** Subject Population Defined by Experimental Group
Results

An intercorrelational item analysis derived four measures of self-efficacy from the Self-Efficacy Questionnaire. The mean of each subject's answers on the first 10 questions was called Exercise. Questions 11-14 concerned selection of proper foods; the mean of answers to these was called Eating. The mean of questions 15-19 was called Dieting, because the questions referred to the ability to maintain a proper diet. Question 23 was found to be worth retaining as a separate measure and was called Stress. Descriptive data for the Self-Efficacy Questionnaire is represented in Table 2 (Appendix H).

As noted in the Method section, six measures of adherence were used. An intercorrelational item analysis indicated using the mean of the four answers to the Dietary Adherence Questionnaire. This was called Diet. The descriptive data is shown in Table 3 (Appendix I). Answers to the first two questions were inverted, so that higher values on all four responses would indicate greater adherence. The data collected on the exercise adherence questionnaire was called Activity. Data from the treadmill test was called Treadmill. Jogging was simply the number of miles run per week. For these three dependent measures (Activity, Treadmill, and Jogging) pre-treatment scores were subtracted from post-treatment scores. An increase on any change score was reflective of adherence.
Weight was the change in body weight from the beginning to the end of the program. Fat was the change in percent body fat. Change scores on the last two measures (Weight and Fat) were reversed in sign so that a decrease would indicate adherence. Descriptive data for the five pre- and post-treatment measures is presented in Table 4 (Appendix J).

Table 5 was calculated to compare the means of Groups I and II to those of Groups III and IV on the six adherence measures. This addresses the issue of whether adherence would

**Table 5**

**Effect of Self-Efficacy Testing Pre-Treatment on Adherence**

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<td></td>
<td></td>
</tr>
<tr>
<td>Groups I &amp; II</td>
<td>5.29</td>
<td>1.08</td>
<td>-.55</td>
<td>34</td>
<td>.589</td>
</tr>
<tr>
<td>Groups III &amp; IV</td>
<td>5.48</td>
<td>.97</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groups I &amp; II</td>
<td>1.94</td>
<td>2.46</td>
<td>.85</td>
<td>34</td>
<td>.403</td>
</tr>
<tr>
<td>Groups III &amp; IV</td>
<td>1.00</td>
<td>3.41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treadmill Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groups I &amp; II</td>
<td>1.58</td>
<td>1.35</td>
<td>1.18</td>
<td>34</td>
<td>.247</td>
</tr>
<tr>
<td>Groups III &amp; IV</td>
<td>1.01</td>
<td>1.45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jogging Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groups I &amp; II</td>
<td>8.38</td>
<td>5.60</td>
<td>.16</td>
<td>34</td>
<td>.876</td>
</tr>
<tr>
<td>Groups III &amp; IV</td>
<td>7.93</td>
<td>8.99</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Body Weight Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groups I &amp; II</td>
<td>-5.89</td>
<td>9.30</td>
<td>.72</td>
<td>34</td>
<td>.475</td>
</tr>
<tr>
<td>Groups III &amp; IV</td>
<td>-11.42</td>
<td>13.09</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Body Fat Change</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Groups I &amp; II</td>
<td>-2.53</td>
<td>2.85</td>
<td>.05</td>
<td>34</td>
<td>.957</td>
</tr>
<tr>
<td>Groups III &amp; IV</td>
<td>-2.59</td>
<td>3.24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
be affected by taking the self-efficacy test prior to starting
the program, as was the case for Groups I and II. Probability
values are two-tailed, using a pooled variance estimate.

Table 6 is a comparison of Group III to Group I on the
four self-efficacy measures from the post-treatment testing.
It was calculated in order to determine whether having taken
the test previously would affect self-efficacy scores on the
post-test. Again, probability values are two-tailed, using
pooled variance.

Table 6

Effect of Pre-Treatment Self-Efficacy Testing on
Post-Treatment Self-Efficacy Testing

<table>
<thead>
<tr>
<th>Variable</th>
<th>X</th>
<th>S.D.</th>
<th>T-Value</th>
<th>DF</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Post Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>5.78</td>
<td>1.18</td>
<td>.43</td>
<td>32</td>
<td>.672</td>
</tr>
<tr>
<td>Group III</td>
<td>5.61</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Post Eating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>5.43</td>
<td>1.29</td>
<td>.42</td>
<td>32</td>
<td>.675</td>
</tr>
<tr>
<td>Group III</td>
<td>5.27</td>
<td>.93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Post Dieting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>5.72</td>
<td>1.47</td>
<td>.97</td>
<td>32</td>
<td>.340</td>
</tr>
<tr>
<td>Group III</td>
<td>5.28</td>
<td>1.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Post Stress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>5.89</td>
<td>1.02</td>
<td>1.48</td>
<td>32</td>
<td>.149</td>
</tr>
<tr>
<td>Group III</td>
<td>5.31</td>
<td>1.25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Two of the self-report compliance measures (Diet and Activity) were checked against more objective criteria, in order to obtain an estimate of their validity. When activity scores on the post-test were compared to post-test treadmill and jogging scores, there was very little correlation ($r = .085$ and $-.002$, respectively). Diet scores correlated significantly with loss of body weight ($r = .280$, $n = 67$, $p < .02$) but not with loss of body fat ($r = .004$).

Table 7 presents the 24 possible correlations between the four self-efficacy measures and the six adherence measures, using the pre-test values of self-efficacy from Groups I and II. The issue here, of course, is the degree to which adherence can be predicted from pre-treatment self-efficacy measures.

Table 7

<table>
<thead>
<tr>
<th>Self-Efficacy</th>
<th>Diet</th>
<th>Activity</th>
<th>Treadmill</th>
<th>Jogging</th>
<th>Weight</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>-.08</td>
<td>-.37*</td>
<td>-.10</td>
<td>.03</td>
<td>.01</td>
<td>.07</td>
</tr>
<tr>
<td>Eating</td>
<td>.44**</td>
<td>-.16</td>
<td>-.21</td>
<td>.12</td>
<td>.09</td>
<td>-.05</td>
</tr>
<tr>
<td>Dieting</td>
<td>.39**</td>
<td>-.31</td>
<td>-.01</td>
<td>-.03</td>
<td>.00</td>
<td>.08</td>
</tr>
<tr>
<td>Stress</td>
<td>.14</td>
<td>-.33*</td>
<td>-.42**</td>
<td>-.36*</td>
<td>.09</td>
<td>-.07</td>
</tr>
</tbody>
</table>

*p < .05

**p < .01
Table 8 shows the same 24 correlations, except that the self-efficacy data are taken from the post-test responses of Groups I and III. This table indicates the degree to which self-efficacy is influenced by one's adherence.

Table 8
Correlations Between Post-Treatment Self-Efficacy and Adherence

<table>
<thead>
<tr>
<th></th>
<th>Diet</th>
<th>Activity</th>
<th>Treadmill</th>
<th>Jogging</th>
<th>Weight</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>.64**</td>
<td>.12</td>
<td>.04</td>
<td>-.01</td>
<td>.31*</td>
<td>-.16</td>
</tr>
<tr>
<td>Eating</td>
<td>.83**</td>
<td>.32*</td>
<td>.18</td>
<td>.16</td>
<td>.41**</td>
<td>-.09</td>
</tr>
<tr>
<td>Dieting</td>
<td>.78**</td>
<td>.26</td>
<td>.01</td>
<td>-.10</td>
<td>.32*</td>
<td>-.18</td>
</tr>
<tr>
<td>Stress</td>
<td>.42</td>
<td>-.07</td>
<td>.07</td>
<td>-.10</td>
<td>.09</td>
<td>-.13</td>
</tr>
</tbody>
</table>

*p < .05  **p < .01

Table 9 again shows the 24 correlations. This time the self-efficacy data are taken only from Group I and reflect changes between pre- and post-treatment efficacy scores.

Table 9
Correlations Between Changes in Self-Efficacy and Adherence

<table>
<thead>
<tr>
<th></th>
<th>Diet</th>
<th>Activity</th>
<th>Treadmill</th>
<th>Jogging</th>
<th>Weight</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>.73**</td>
<td>.32*</td>
<td>.25</td>
<td>.53*</td>
<td>.42*</td>
<td>.46*</td>
</tr>
<tr>
<td>Eating</td>
<td>.33</td>
<td>.53*</td>
<td>.71**</td>
<td>.33</td>
<td>.30</td>
<td>.64**</td>
</tr>
<tr>
<td>Dieting</td>
<td>.45*</td>
<td>.56*</td>
<td>.51*</td>
<td>.48</td>
<td>.20</td>
<td>.48*</td>
</tr>
<tr>
<td>Stress</td>
<td>-.09</td>
<td>.22</td>
<td>.91**</td>
<td>-.42</td>
<td>-.23</td>
<td>.18</td>
</tr>
</tbody>
</table>

*p < .05  **p < .01
For five of the compliance measures—all except Diet—data were available from both the beginning and end of the program. These data were used to define a "successful" group—increase on the measure—and an "unsuccessful" group—decrease or no change on the measure—for each of the five repeated measures. The successful group was then compared to the unsuccessful one by running a t-test between the means of each self-efficacy measure on both the pre- and post-test. These tests were run using an orthogonal comparisons technique in order to assure independence of the individual tests.

The successful jogging group was significantly lower on the pre-test measure of Stress. The successful activity group was significantly lower on the pre-test measure of Exercise. The successful Weight group was significantly higher on post-test Dieting. The successful Treadmill group was significantly higher on post-test Eating. These data are presented in Table 10.

Discussion

Research in the area of self-efficacy has been with certain atypical populations such as cardiac rehabilitation patients and various types of phobics. This type of research allows for a great deal of stimulus control, but little generalization to more normative groups. Under ideal circumstances, self-efficacy, as it relates to
Table 10
Comparison of Successful Groups Versus Unsuccessful Groups by Self-Efficacy Measure Pre- and Post-Treatment

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>T-value</th>
<th>DF</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment Stress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsuccessful Jogging Group</td>
<td>11</td>
<td>6.27</td>
<td>.79</td>
<td>2.12</td>
<td>34</td>
<td>.041</td>
</tr>
<tr>
<td>Successful Jogging Group</td>
<td>25</td>
<td>5.60</td>
<td>.91</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-treatment Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsuccessful Activity Group</td>
<td>14</td>
<td>6.22</td>
<td>.85</td>
<td>2.71</td>
<td>34</td>
<td>.011</td>
</tr>
<tr>
<td>Successful Activity Group</td>
<td>22</td>
<td>5.42</td>
<td>.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Treatment Dieting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsuccessful Weight Group</td>
<td>11</td>
<td>4.75</td>
<td>1.57</td>
<td>2.47</td>
<td>32</td>
<td>.019</td>
</tr>
<tr>
<td>Successful Weight Group</td>
<td>23</td>
<td>5.88</td>
<td>1.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Treatment Eating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsuccessful Treadmill</td>
<td>6</td>
<td>4.54</td>
<td>.66</td>
<td>2.04</td>
<td>32</td>
<td>.049</td>
</tr>
<tr>
<td>Successful Treadmill</td>
<td>28</td>
<td>5.55</td>
<td>1.31</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
adherence, should be studied relative to an individual's self-confidence in regard to that person's specific health behavior prescription. This study was undertaken with the knowledge that both experimental stimulus control, as well as administrative control, was to be compromised. Functionally, this results in two major weaknesses in the design; there is not a clearly explicit assessment of outcome expectations, and there is a lack of validity regarding the compliance measures. However, such compromises were deemed necessary in order to test the relevance of self-efficacy theory, by applying it to a population like that described in the literature as being at risk for lack of adherence to health behaviors.

**Procedural Tests**

Administration of the test instrument did not alter adherence. When Groups I and II are compared to Groups III and IV, there are no significant differences in any of the adherence measures. This is indicated in Table 5. Even the direction of the small differences is not consistent; i.e., Groups I and II increased slightly more in Activity, Treadmill, and Jogging, but Groups III and IV improved slightly in Diet and lost a little more Weight and Fat. In this sense, the test instrument could be considered an unobtrusive measure, since its use did not seem to have any effect on adherence.
Having taken the instrument once did not effect results when it was taken again. When Group I is compared to Group III on the four self-efficacy measures from the post-test, there are no significant differences. This is shown in Table 6. The Group I values tend to be slightly higher, but the differences are quite small.

Lack of significant correlation between reported activity levels and either Treadmill or Jogging indicates that the activity measure must be viewed with some skepticism. The Diet measure appears to be more valid because of its correlation with body weight loss. The very low correlation with loss of body fat may be due to the slower loss of body fat relative to loss of body weight. Another factor could be that some subjects were adherent with nutritional prescription but not with exercise, thereby losing lean body mass along with body fat. This would explain the paradox of how it would be possible to be adherent (loss of body weight) and nonadherent (no positive change in body composition). Thus, weight may be a better measure of short-term adherence, whereas percent body fat would be more evident in long-term perspective.

Self-Efficacy as a Predictor of Adherence

The most striking thing about Table 7 is that 13 of the 24 predictions, including four of the six significant ones, are in the incorrect direction! It may be useful to
separate Table 7 into three parts. First, self-efficacy as measured by the Eating and Dieting questions does predict adherence as measured by Diet. Those subjects who believe that they can be effective in controlling food intake later state that they have improved their behavior in this area. However, neither of these self-efficacy measures (Eating or Dieting) correlates with loss of body weight or reduction in percentage of body fat. Thus, the idea that self-efficacy can predict adherence receives only marginal support from these data. Second, it must be noted that none of the self-efficacy measures seems to be related to adherence as measured by Weight or Fat. The third section of Table 7 can be conceptualized as the 12 correlations between the four self-efficacy measures and the adherence measures of Activity, Treadmill, and Jogging. Of these 12, ten--including the four significant ones--are negative. There is a clear implication that those subjects who are more confident of their effectiveness are actually less likely to comply with the program. This is supported by the t-tests on successful versus unsuccessful groups, where success in Jogging was associated with low self-efficacy on Stress and success in Activity was associated with low self-efficacy on Exercise, as shown in Table 10.
The best conclusion that can be drawn is that assessment of self-efficacy, prior to experience with some given behavior, such as exercise, is a poor predictor of adherence. On the other hand, to the extent that any prediction is possible, it appears that the more experience one has with a given regime, such as Dieting or Eating, the more predictive the instrument becomes. Additionally, there appears to be a trend for individuals, with little or no experience regarding a given behavior under assessment pre-treatment, to overjudge their ability to comply and in fact to be less adherent.

**Effect of Adherence on Self-Efficacy**

Table 8 presents an almost opposite picture to Table 7. Of the 24 correlations, 16 are in the expected direction, including all eight of the significant ones. Compliance clearly leads to an increase in self-efficacy. Some of the adherence measures are better than others in influencing positive self-efficacy. Those subjects who report adherence on the Diet measure, and those whose actual Weight has improved, seem to increase the most in self-efficacy. Results from the success groups in Weight and Treadmill also indicate that higher adherence leads to higher self-efficacy. The results are to be expected in that when one has positive self-evident feedback from one's own endeavors, there is an increase in self-efficacy regarding one's ability to persist in the behaviors.
When only changes in self-efficacy are examined, as in Table 9, the picture becomes even clearer. Here 21 of the possible correlations are positive, and 12 of these are significant. It is interesting to note that the stress measure of self-efficacy has a strong, significant, positive relationship with compliance, as measured by Treadmill. There is, however, a nonsignificant trend in the opposite direction on the measures of Diet, Jogging and Weight. Perhaps these individuals found aerobic exercise to be a stress coping strategy, were therefore compliant, and experienced an increase in their confidence to manage stress. This would result in a positive change in Treadmill, but not necessarily on the Jogging measure, in so far as they could well have increased aerobic capacity without necessarily increasing Jogging by using other aerobic modalities. The negative trend in regard to Diet and Weight suggests that these individuals were adherent to exercise, but not to nutritional prescription.

In conclusion, the results of this study indicate that measurement of self-efficacy has no effect on performance in the program, nor does assessment of pre-treatment efficacy effect measurement of post-treatment efficacy. There is strong evidence that adherence increases self-confidence in regard to being able to persist with that which one has mastered. These findings are congruent with other self-efficacy
research, but has now been demonstrated to be valid with a heterogeneous population involved in a multi-treatment, interactive program. The idea that levels of adherence can be predicted from levels of pre-treatment self-efficacy was not supported. Rather, what is suggested is that the predictive validity of the Self-Efficacy Questionnaire varies with the amount of experience one has had regarding the behavior being assessed.

Certainly the outcome of this study indicates the need for more research in the area of Self-Efficacy Theory as it relates to adherence. In particular, a similar investigation, with greater stimulus control, as well as direct assessment of outcome expectations would be of value. Finally, self-efficacy should be measured after the subjects have had enough experience with a given regimen to give a valid estimate of their confidence in being able to persist with the behaviors in question.
Appendix A

Table 1
Descriptive Data on Population

<table>
<thead>
<tr>
<th></th>
<th>Total Population</th>
<th>Men (n = 25)</th>
<th>Women (n = 42)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age in years</strong></td>
<td>41.34</td>
<td>41.0</td>
<td>41.5</td>
</tr>
<tr>
<td><strong>Body weight in pounds</strong></td>
<td>180.0</td>
<td>143.0</td>
<td>143.0</td>
</tr>
<tr>
<td><strong>Percent Body Fat</strong></td>
<td>21.4</td>
<td>23.4</td>
<td>27.2</td>
</tr>
</tbody>
</table>

Range: 23-68
Appendix B

Program Design and Sequence

1. **Medical Screening**: Each participant received a comprehensive medical review including health history, health hazard appraisal, resting and exercise electrocardiogram, resting blood pressure, resting heart rate, and blood analysis.

2. **Fitness Assessment**: Each participant then received an evaluation of their physical fitness level, i.e., flexibility, strength, body girth, body composition, cardiovascular assessment, and nutritional assessment. These tests were delivered to the program participants in their respective schools to reduce the teachers' time away from the classroom. All psychological data related to research was also collected at this time.

3. **Goal Setting**: Each participant received an individual counseling session to review all test results (health, nutrition, and fitness) and to apply these results to specific goals and directions for improvement. Follow-up counseling sessions also occurred at the six week point to insure that proper recommendations were being followed and to reinforce the participant.

4. **Exercise Prescription**: Each participant received an individualized exercise prescription including program information to improve the following areas: cardiovascular health, weight control (body composition), strength and flexibility. Additional recommendations were given to help each participant
5. Educational Modules: A workbook/manual was developed for each participant which included nine (9) specific educational modules. A 50 minute class was held weekly to teach this material. Program participants reported before school for these classes. All topics related to the specific needs of the participants. Module topics were as follows:

1. A Physical Program
2. The Concept of Wellness
3. Nutrition and Weight Control
4. Exercise - Aerobics*
5. Exercise - Flexibility
6. Exercise - Strength
7. Stress and Relaxation
8. Total Fitness
9. Substance Abuse
10. Maintenance - Positive Lifestyle Patterns

A report card was utilized to allow the teachers to receive weekly feedback about their progress. All reports and discussions were held during the above discussed class period. These classes also included audio-visual materials. In addition to these weekly classes, five evening seminars with professional staff were also conducted for the participants and their spouses. These sessions were designed to reinforce the educational aspect of the program and included the following topics:
1. Nutrition
2. Fitness and Coronary Risk
3. Motivation and Lifestyle
4. Alcohol and Drug Abuse
5. Stress

6. Exercise Leadership: Weekly exercise sessions were conducted at each school to increase the participants' awareness of correct exercise techniques and to allow for group exercise. Each session lasted 55 minutes and included the following:
   1. Aerobic Dance
   2. Walking
   3. Jogging
   4. Group Calisthenics
   5. Flexibility Training
   6. Strength Training
   7. Exercise Instruction

7. Motivation: A variety of motivational sources were used in the program to facilitate the participants' interest, enthusiasm, and adherence to the program. These included the following:
   1. Behavior Contracting
   2. Weekly Report Cards
   3. The Aerobic Point System
   4. T Shirts
   5. Fitness Awards for Excellence
   6. Banquet and Awards Session
7. Workbook, Materials, Films
8. Evening Seminars for the Families
9. Program Communication Correspondence

8. Feedback: Each participant received various feedback information to assist in keeping interest high. Feedback included:

1. Pre- and Post-Fitness Assessments
2. The Aerobic Point System
3. Weekly Weight Monitoring
4. Bi-weekly Quizzes and Tests of Subject Material
5. Fitness Award System

*It should be emphasized that, in addition to the weekly group aerobic exercises, each individual participant chose what type of aerobic activity to engage in on the other two days of the week his/her contract called for. Approximately 80% of the participants chose jogging as their primary aerobic activity; the others selected such activities as swimming or biking.
Appendix C

Self-Efficacy Measure

This questionnaire is a new source of data for the Aerobic Center/Dallas Independent School District Aerobic Fitness and Stress Management Program. Please read each of the questions and write by each item a number from the scale which best describes how confident you are that the statements apply to you. Be sure to answer every item in your responses.

The Scale

Not at all confident 1 2 3 4 5 6 7 Extremely confident

The number seven represents extreme confidence on your part that you can perform the task described in a given question. As the numbers become smaller down the scale, this represents less and less confidence that you can perform the task in question.

Please enter your Wellness Program identification number:
How confident are you that you can... response

____ 1. exercise vigorously for at least 20 minutes for 1-2 days per week?
____ 2. exercise vigorously for at least 20 minutes for 3-4 days per week?
____ 3. exercise vigorously for at least 20 minutes for 5-6 days per week?
____ 4. get back on schedule if you fail to exercise for 2-5 days?
____ 5. get back on schedule if you fail to exercise for 1-2 weeks?
____ 6. get back on schedule if you fail to exercise for 3 weeks to a month?
____ 7. overcome the aches and pains of starting your exercise program?
____ 8. adhere to your exercise program for one month?
____ 9. adhere to your exercise program for two months?
____ 10. adhere to your exercise program for three months?
____ 11. eat a greater variety of healthful foods?
____ 12. eat fewer foods that are loaded with sugar?
____ 13. eat fewer foods that are high in fat, saturated fat, and cholesterol?
____ 14. eat more foods with adequate starch and fiber?
____ 15. get back on your diet if you "go off" for 1-2 days?
____ 16. get back on your diet if you "go off" for 3-4 days?
____ 17. get back on your diet if you "go off" for a week?
____ 18. get back on your diet if you "go off" for 2 weeks?
19. stick with your diet no matter how long it takes to achieve and/or maintain ideal body weight?

20. get an adequate amount of sleep?

21. drink alcohol moderately and infrequently (if you drink at all)?

22. stop smoking cigarettes (if you smoke)?

23. deal more effectively with the stresses in your life?
Appendix D

Self-Efficacy Questionnaire Reliability

The population was 107 (67 female, 40 male) subjects of the Cooper Clinic at the Aerobic's Center, with a mean age of 40.1 years, S.D. 8.3. The items on the self-efficacy questionnaire were divided into "X" (even numbers) and "Y" (odd numbered items). This resulted in a correlation coefficient of .92 and a split-half reliability factor of .96.
Appendix E

Dietary Adherence Questionnaire

It is the purpose of this questionnaire to gather information about your participation in the Aerobics Center/Dallas Independent School District Aerobic Fitness and Stress Management Program. Please read each of the questions and write by each item a number from the scale below which best describes how you have performed that behavior.

The Scale

Not at all like me                        Extremely like me

1 2 3 4 5 6 7

The number seven represents that the statement is extremely descriptive of your eating habits since entering the Program. As the numbers become smaller down the scale, this represents that the statement is less and less descriptive of your eating habits since entering the Program.

Thank you for your assistance and cooperation.

Please enter your Wellness Program identification number ____________________

Since entering the Wellness Program I have been . . .

___ 1. eating more foods high in starch and fiber.
___ 2. eating fewer foods high in fat and cholesterol.
___ 3. eating fewer foods that are loaded in sugar.
___ 4. able to stay on a prudent diet.
Appendix F

Exercise Adherence Questionnaire

How do you rate the physical activity that you are now getting compared to others your same age and sex? Think about both your leisure and work activities.

1. Extremely inactive
2. Inactive
3. Somewhat inactive
4. About average
5. Somewhat active
6. Active
7. Extremely active
Appendix G

Modified Bruce Protocol Procedure for Treadmill Time Assessment

The technique for assessment of Treadmill was to run the subject to 85% of maximum heart rate, which was the criterion for ending the test. Maximum times were calculated by:

Men - 205 - .5 age x .85

Women - 220 - age x .85

The format was to test each subject by the following schedule:

<table>
<thead>
<tr>
<th>minute</th>
<th>grade</th>
<th>speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3:00</td>
<td>10%</td>
<td>1.7 mph</td>
</tr>
<tr>
<td>3:01 - 6:00</td>
<td>12%</td>
<td>2.5 mph</td>
</tr>
<tr>
<td>6:01 - 9:00</td>
<td>14%</td>
<td>3.4 mph</td>
</tr>
<tr>
<td>9:01 - 12:00</td>
<td>16%</td>
<td>4.2 mph</td>
</tr>
<tr>
<td>12:01 - 15:00</td>
<td>18%</td>
<td>5.0 mph</td>
</tr>
<tr>
<td>15:01 - 18:00</td>
<td>20%</td>
<td>5.5 mph</td>
</tr>
</tbody>
</table>
Appendix H

Table 2

Descriptive Data on Self-Efficacy Questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Exercise</th>
<th>Eating</th>
<th>Dieting</th>
<th>Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>S.D.</td>
<td>X</td>
<td>S.D.</td>
</tr>
<tr>
<td>Group I (n = 18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Treatment</td>
<td>5.1</td>
<td>1.4</td>
<td>5.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Post-Treatment</td>
<td>5.7</td>
<td>1.4</td>
<td>5.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Group II (n = 18)</td>
<td>5.6</td>
<td>1.3</td>
<td>6.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Group III (n = 16)</td>
<td>5.6</td>
<td>1.3</td>
<td>5.3</td>
<td>1.0</td>
</tr>
</tbody>
</table>
### Appendix I

#### Table 3

**Descriptive Data on Dietary Adherence Questionnaire**

<table>
<thead>
<tr>
<th>Group</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (n = 18)</td>
<td>5.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Group II (n = 18)</td>
<td>4.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Group III (n = 16)</td>
<td>4.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Group IV (n = 15)</td>
<td>4.4</td>
<td>1.3</td>
</tr>
</tbody>
</table>
Appendix J

Table 4

Measures of Adherence

<table>
<thead>
<tr>
<th></th>
<th>Pre-Treatment</th>
<th>Post-Treatment</th>
<th>Change Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>S.D.</td>
<td>$\bar{X}$</td>
</tr>
<tr>
<td>Activity (n = 67)</td>
<td>3.6</td>
<td>1.6</td>
<td>5.1</td>
</tr>
<tr>
<td>*Treadmill (n = 67)</td>
<td>5.9</td>
<td>2.0</td>
<td>7.0</td>
</tr>
<tr>
<td>**Jogging (n = 52)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>miles per week</td>
<td>2.0</td>
<td>5.1</td>
<td>9.7</td>
</tr>
<tr>
<td>Weight in pounds (n = 67)</td>
<td>155.3</td>
<td>29.7</td>
<td>152.0</td>
</tr>
<tr>
<td>Fat in pounds (n = 67)</td>
<td>26.9</td>
<td>6.8</td>
<td>25.0</td>
</tr>
</tbody>
</table>

*seconds converted to fraction of minutes.

**n = 52 due to remaining subjects choosing another primary aerobic activity.
References


*Milbank Memorial Fund Quarterly, 44*, 94.

Champaign, Ill.: Human Kinetics, Inc.


