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A MULTI-MODEL APPROACH

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PREDICTING PARTICIPATION IN AEROBIC EXERCISE: A MULTI-MODEL APPROACH

by

Galen Arthur Yordy

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ABSTRACT

PREDICTING PARTICIPATION IN AEROBIC EXERCISE:
A MULTI-MODEL APPROACH

By

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A concern of health psychologists and other health care professionals is the failure of a majority of persons in the United States to engage in regular aerobic exercise. This research used multiple linear and logistic regression to compare the relative utility of several key variables in predicting the intentions to engage in aerobic exercise and actual future aerobic exercise behavior of 284 college students. The predictor variables included prior aerobic exercise behavior, perceived social support, and the central predictors of the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen, 1985; Ajzen & Madden, 1986; Schifter & Ajzen, 1985), and social cognitive theory (Bandura, 1986). Data were collected by means of a questionnaire administered to the subjects at the beginning and the end of a 1-week test period.

Results indicated that, of the theoretical variables, only the theory of reasoned action variable of attitude and the social cognitive theory variable of self-efficacy were important in predicting intention, and that the effects of these variables went beyond those of prior behavior. Only

the theory of reasoned action's intention was important in predicting aerobic exercise behavior, and its effects also exceeded those of prior behavior. The theory of reasoned action variable of subjective norm, the theory of planned behavior variable of perceived behavioral control, the social cognitive theory variable of outcome expectations, and perceived social support played little or no unique role in predicting either intentions to engage in aerobic exercise or actual aerobic exercise behavior. Results for perceived behavioral control should be viewed cautiously because of restriction of range and marginal reliability of the measure.

Preliminary supplementary results indicated that the theoretical variables may not be particularly useful in predicting aerobic exercise among persons already regularly engaged in it. Preliminary factor analysis results suggested that two factors may underlie the theoretical variables: one reflecting a general perceived competence in, or proclivity toward, aerobic exercise; the other a possible reliance on others (as opposed to self) for exercise motivation.

To my parents, Elmer and Frieda Yordy, with love

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CHAPTER 1

Introduction

Statement of the Problem

Despite the growing body of evidence suggesting that regular aerobic exercise is beneficial for both physical and psychological well-being (Blair et al., 1989; deVries, 1986; Haskell, 1984; Siscovick, LaPorte, & Newman, 1985; Taylor, Sallis, & Needle, 1985), it appears that a majority of persons in this country do not exercise in a manner that will allow them to realize such benefits. For example, the Centers for Disease Control (1989) reported that as of 1987 only about 8% of Americans ages 18 to 65 were participating regularly in vigorous physical activity. Oldridge (1984) indicated that approximately 40% to 50% of patients with coronary heart disease entering prescribed exercise programs dropped out within 12 months, and that only 40% of such patients completed 48 months of participation. Figures are nearly identical for healthy adults who enter fitness programs of at least 6 months duration (Oldridge, 1984). Thus, "ensuring that exercise behavior becomes habitual for those who might benefit from it" (Dishman, 1982, p. 238) would seem to be an important concern for health care

professionals in general, and for health psychologists in particular.

Dishman (1981b) suggested that an understanding of the determinants of exercise represents a first step in the facilitation of exercise adherence, and many researchers have searched for variables that may be associated with exercise adherence or dropout. However, such studies have yielded somewhat inconsistent results across a number of subject, social/environmental, and programmatic variables, so that at present the literature does not offer a sound understanding of exercise behavior.

Another problem with the exercise adherence literature has been its atheoretical nature (Dishman, 1982; Folkins & Sime, 1981; Martin & Dubert, 1985), which has frequently resulted in "fragments of research which have generally not been connected by a logical progression of inquiry" (Dishman, 1982, p. 259). Perhaps most important, lack of theoretical underpinning has precluded the development of a technology which would allow us to distinguish systematically those who are likely to maintain a program of regular aerobic exercise from those who are not, and to encourage increased aerobic exercise in the latter group.

In addition, the exercise adherence literature has focused largely on prescribed treatment programs that are frequently institutionally based. As Martin and Dubbert (1985) pointed out, studying persons who successfully

initiate and maintain programs of aerobic exercise on their own may provide new hypotheses for improving adherence levels of those who have been less successful in this regard.

Purpose of the Study

This investigation sought to predict involvement in sustained, self-initiated programs of aerobic exercise by examining three theories of behavior: the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen, 1985; Ajzen & Madden, 1986; Schifter & Ajzen, 1985), and social cognitive theory (Bandura, 1986). These theories posit certain factors that should predict or determine discrete behaviors, such as aerobic exercise. In addition, because one of the most frequently used predictors of behavior in psychology has been past performance, this research compared the utility of the central variables of these theories with past performance in predicting future aerobic exercise.

It should be noted that Dzewaltowski, Noble, and Shaw (1989) conducted a study similar to this one (see Chapter Two). The present research extended their work by considering an additional variable that the exercise literature suggests may be important for adherence to aerobic exercise: perceived social support. In addition, whereas Dzewaltowski et al. (1989) used hierarchical regression analysis to compare the predictive strengths of the concepts

of interest, this research augmented this approach by comparing the relative amounts of variance explained in the dependent variables by each theory, in the belief that this may provide a clearer, and perhaps more accurate, picture of the relative predictive utilities of the pertinent independent variables. Furthermore, unlike the Dzewaltowski et al. (1989) research, this investigation examined the potential complementary nature of the theories and their key constructs.

In sum, this research applied a theoretically-based analysis to an area of investigation that has largely been approached atheoretically, and to a population that has been generally understudied: persons who may or may not be involved in ongoing, self-initiated programs of aerobic exercise. When supported by empirical research, these theories may provide an understanding of the determinants of aerobic exercise, and suggest a means to increase participation in this behavior. In addition, comparison of the theories' predictive validities, along with a consideration of the variable of perceived social support, may provide an indication of the most efficacious model to guide further inquiry.

Overview of the Theories

The Theory of Reasoned Action

The theory of reasoned action is based on the assumption that "human beings are usually quite rational and make systematic use of the information available to them" (Ajzen and Fishbein, 1980, p. 5). It is designed to explain virtually any human behavior that is under volitional control. The relationships among the theory's central concepts are summarized in Figure 1.1. The solid arrows in this diagram indicate the hypothesized direction of primary influence, whereas the broken arrows indicate feedback loops whereby direct experience with a behavior may affect the cognitive determinants of the behavior.

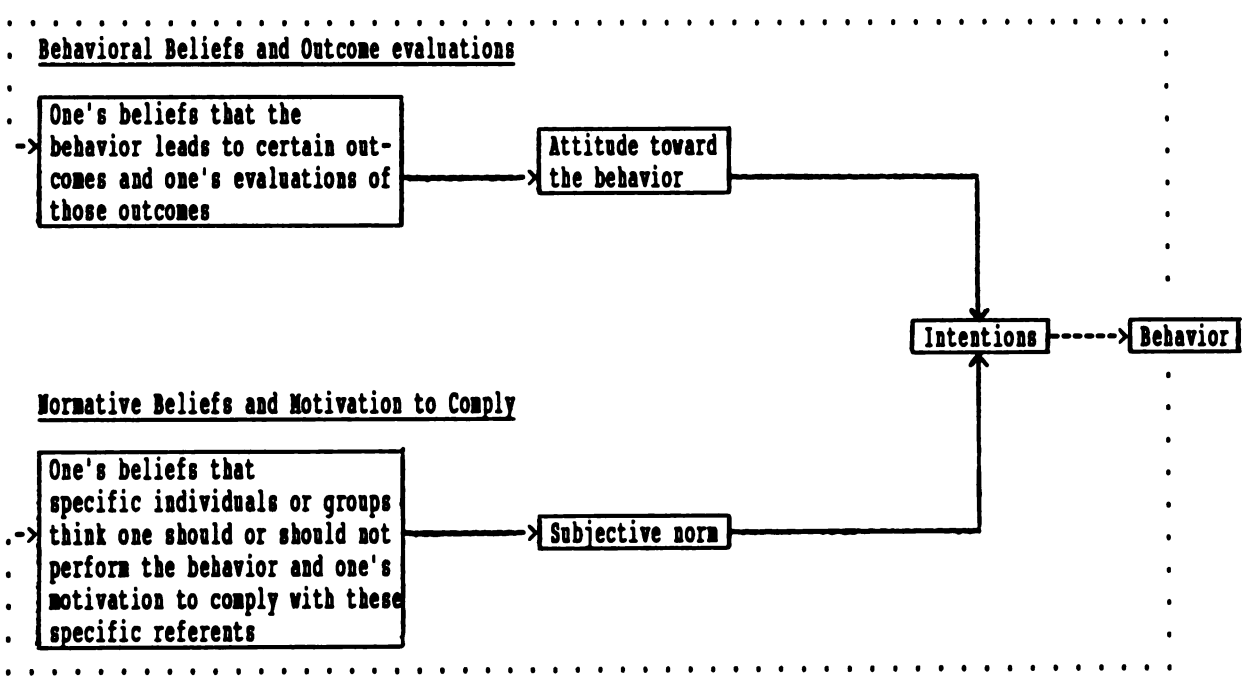

Figure 1.1. Relationships of the conceptual elements of the theory of reasoned action.

The theory views an intention to perform or not to perform a behavior (behavioral intention) as the immediate determinant of action, barring unforeseen events that may occur between the formation of the intention and the execution of the behavior. An understanding of the formation of an intention requires the identification of its two determinants: one's attitude, which refers to one's judgment that performing a given behavior is good or bad, and one's subjective norm, which refers to one's perception of the social pressures placed upon one to perform or not to perform a behavior. According to Ajzen and Fishbein (1980), one will intend to perform a behavior when one evaluates it positively and believes that important others think one should perform it. Moreover, one of these two factors may be relatively more important than the other in the formation of a given intention.

For many purposes it may be sufficient to explain intentions and behaviors by reference to attitudes and subjective norms alone. However, for a more complete understanding of the factors that influence behavior one must also consider the determinants of the attitudinal and normative components. According to the theory, attitudes are a function of one's beliefs about the outcomes of a given behavior and one's evaluations of those outcomes. Generally speaking, if one believes that performing a behavior will

lead to mostly positive outcomes one will have a favorable attitude toward performing it, and if one believes that performing a behavior will lead to mostly negative outcomes one's attitude will be negative.

Subjective norms, on the other hand, are determined by beliefs about whether specific important people or groups in one's life believe one should or should not perform a behavior. Generally speaking, if one believes that most significant referents with whom one is motivated to comply think one should perform a behavior one will perceive social pressure to do so, whereas if one believes that such referents think one should not perform a behavior one will perceive inhibitory social pressure. Thus, according to this model behavior is ultimately determined by behavioral and normative beliefs, and it is these that must be modified in order to change behavior. It is also important to note that intentions are hypothesized to mediate the effects of attitudes and subjective norms on behavior, and that attitudes and subjective norms are hypothesized to mediate, respectively, the effects of behavioral and normative beliefs on intentions.

The Theory of Planned Behavior

According to Ajzen and Madden (1986), a fundamental problem with the theory of reasoned action is its stipulation that the behavior under consideration must be under

volitional control. They stated that "A behavior may be said to be completely under a person's control if the person can decide at will to perform it or not to perform it. Conversely, the more that performance of the behavior is contingent on the presence of appropriate opportunities or on possession of adequate resources..., the less the behavior is under volitional control" (Ajzen & Madden, 1986, p. 455).

Ajzen (1985) pointed out that volitional control may be affected by factors that are "internal" to the individual, such as information, skills, abilities, willpower, emotions, and compulsions; and/or factors that are "external" to her or him, such as time, opportunity, and dependence on others. In any case, whenever the question of volitional control figures significantly in the performance of a behavior the theory of reasoned action will be insufficient to predict it. "To ensure accurate prediction of behavior over which individuals have only limited control, we must assess not only intention but also obtain some estimate of the extent to which the individual is capable of exercising control over the behavior in question" (Ajzen & Madden, 1986, p. 456). Thus, the theory of planned behavior goes beyond the theory of reasoned action by including the concept of behavioral control. The central concepts of the theory of planned behavior are illustrated in Figure 1.2.

Ajzen and Madden (1986) stated that while it may be very difficult or even impossible to assess the degree of actual control one may have over a given behavior, it is possible to assess one's degree of perceived behavioral control--that is, one's belief regarding how easy or

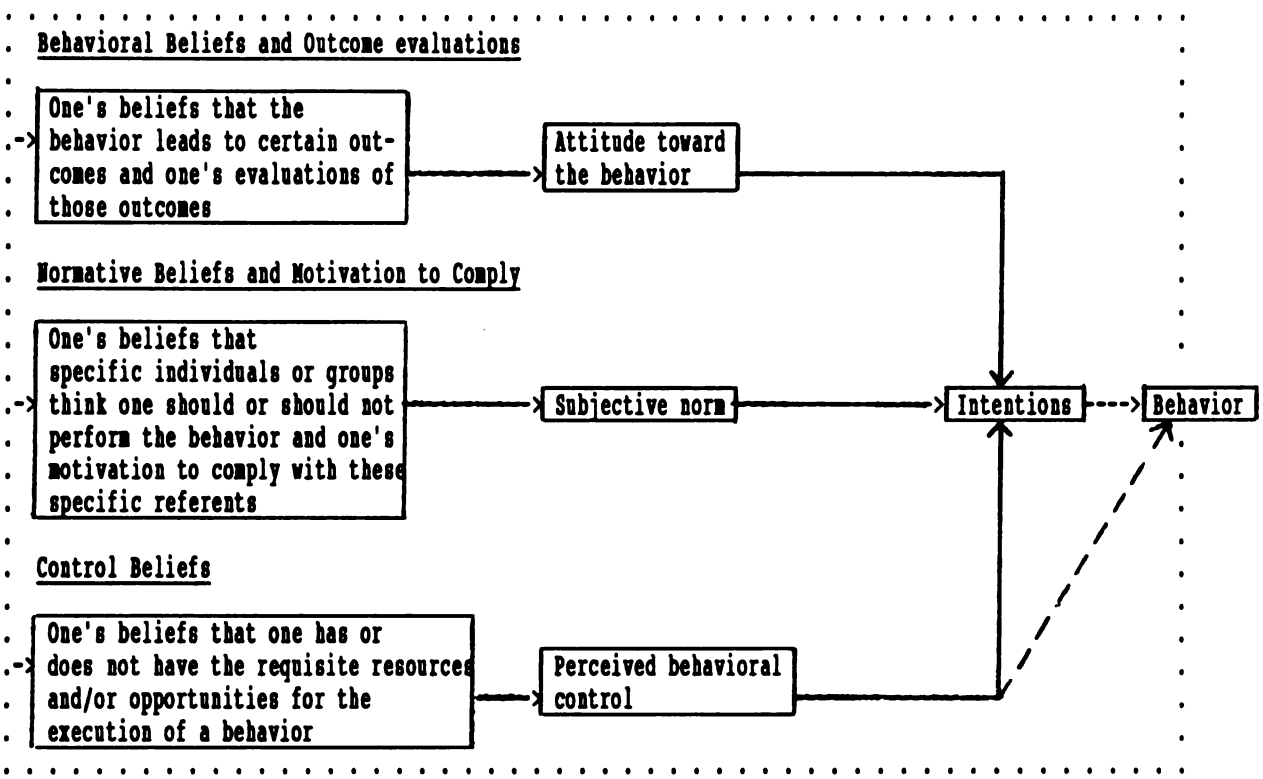

Figure 1.2. Relationships of the conceptual elements of the theory of planned behavior.

difficult performing the behavior is likely to be. Moreover, just as behavioral beliefs determine attitudes and normative beliefs determine subjective norms, control beliefs (those concerning resources and opportunities) determine perceived behavioral control. Generally speaking, the "more resources and opportunities individuals think they possess, and the

fewer obstacles or impediments they anticipate, the greater should be their perceived control over the behavior" (Ajzen & Madden, 1986, p. 457).

Ajzen and Madden (1986) further suggested that perceived control has direct causal effects on intention that are independent of attitude and subjective norm. However, they added that it may be argued that perceived control is a necessary but not sufficient condition for the formation of an intention to perform a behavior, such that in addition to "believing that one could perform a behavior, one must also be inclined to do so for other reasons" (Ajzen & Madden, 1986, p. 459). Thus, perceived control may interact with attitude and subjective norm to influence intention.

The authors also pointed out that inasmuch as perceived control reflects actual control it can in itself help to predict a behavior. Thus, "perceived behavioral control can influence behavior indirectly, via intentions, and it can also be used to predict behavior directly because it may be considered a partial substitute for a measure of actual control" (Ajzen & Madden, 1986, p. 459). This possibility is expressed in Figure 1.2 by the broken arrow extending from perceived behavioral control to behavior. In addition, perceived behavioral control may interact with intentions to affect behavior.

Ajzen and Madden (1986) emphasized, however, that strong direct effects for perceived control on behavior can

be expected only under two conditions: (a) the behavior under consideration must not be under complete volitional control, (b) perceptions of behavioral control must reflect actual control with some degree of accuracy. If the first condition is not met, the theory of planned behavior reduces to the theory of reasoned action, which focuses on volitional behavior. If the second condition is not met, perceived control can add little to the prediction of behavior.

Social Cognitive Theory

For Bandura (1986), "human functioning is explained in terms of a model of triadic reciprocality in which behavior, cognitive and other personal factors, and environmental events all operate as interacting determinants of each other" (p. 18). These elements are not necessarily equipotent. Rather, the relative influence of any of them varies as a function of different activities, individuals, and circumstances, so that in "most instances, the development and activation of the three sets of interacting factors are all highly interdependent" (Bandura, 1986, p. 24).

Although this conceptualization would seem to pose significant problems for the scientific study of causal processes, such is not altogether so because the mutually influential elements do not interact simultaneously. It is thus possible "to gain some understanding of how different segments of two-way causation operate without having to mount

a Herculean effort to study every possible interactant at the same time" (Bandura, 1986, p. 25). According to her or his interests, a researcher may focus on a particular segment of the triadic network, and thus gain some understanding of causal processes from that perspective.

Within the context of triadic reciprocality, Bandura (1986) defined human nature in terms of singular capacities made possible by advanced neurophysiological structures and mechanisms developed over the course of evolution. Most important of these capacities are symbolization, forethought, vicarious learning, self-regulation, and self-reflection. Bandura (1986) particularly regarded the latter capacity as "distinctively human" (p. 21), and suggested that "self-referent thought mediates the relationship between knowledge and action" (p. 390). Moreover, probably most significant of the many types of self-referent thoughts are judgments of perceived self-efficacy, which Bandura (1986) defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). Perceived self-efficacy is "concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses" (Bandura, 1986, p. 391).

Bandura (1986) distinguished self-efficacy judgments from response-outcome expectations, which refer to judgments of the likely consequences of a given behavior. The

distinction is important because "individuals can believe that a particular course of action will produce certain outcomes, but they do not act on that outcome belief because they question whether they can actually execute the necessary activities" (Bandura, 1986, p.392). Thus, for most activities outcome expectancies are largely dependent upon self-efficacy expectancies, and although outcome expectancies play a role in the regulation of behavior, they may not add much to the prediction of behavior on their own. Nevertheless, "In any given instance, behavior can be predicted best by considering both self-efficacy and outcome beliefs" (Bandura, 1986, p. 446).

CHAPTER 2

Literature Review

The following review examines the potential physiological and psychological benefits of exercise, the specific nature of aerobic exercise, the aerobic exercise adherence literature, and applications of the theory of reasoned action, the theory of planned behavior, and social cognitive theory. It also considers the possible role of social support in exercise adherence. It is based on computer (utilizing Index Medicus and Sport Data Base) and manual searches of the psychological, sport, exercise, and medical literature dating from 1967 to 1990.

Potential Physiological and Psychological Benefits of Exercise

In a review of the literature, Haskell (1984) reported that exercise is important for the maintenance of optimal body weight and composition, and that individuals with chronic obstructive lung disease, kidney failure, and arthritis tend to show clinical improvement with exercise. Based on their review, Siscovick et al. (1985) reported that habitual exercise has positive effects in terms of reduced overall risk of coronary heart disease (CHD) and sudden

cardiac death. They further noted that cohort studies suggest that habitual physical activity reduces the risk of developing hypertension, and that clinical studies suggest that such activity improves the control of hypertension. In another review, deVries (1986) concluded that both animal and human studies suggest that exercise helps maintain bone density, increases the strength of connecting tissue around joints, and lowers resistance to movement in joints. More recently, Blair et al. (1989) provided evidence suggesting that even modest increases in physical fitness are associated with reduced risk of all-cause mortality and cancer.

Although methodological limitations preclude definitive conclusions at this time, it also appears that exercise may have positive effects on psychological functioning. For example, in their review, Taylor et al. (1985) indicated that physical activity appears to be useful for relieving mild-to-moderate depression, enhancing self-concept and confidence in children, improving social skills in mentally retarded individuals, reducing anxiety, and moderating coronary-prone (Type A) behavior. In addition, they reported that exercise might provide a beneficial adjunct to alcohol and other substance abuse programs.

Aerobic Exercise

The type of exercise that appears to offer the greatest physiological and psychological benefit is "aerobic" exercise, which "requires the use of large muscles and consists of moving the body weight against gravity or over a distance using rhythmic or dynamic movements" (Haskell, 1984, p. 413). Examples include jogging, walking, swimming, bicycling, cross-country skiing, rope skipping, and aerobic dance. To obtain optimal benefits, the American College of Sports Medicine (1978) recommends that such activity occur with a frequency of 3 to 5 days per week, at an intensity of from 60% to 90% of maximum heart rate reserve or 50% to 85% maximum oxygen uptake (VO^2 max--a measure widely accepted as a criterion of cardiorespiratory endurance capacity), and with a continuous duration of 15 to 60 minutes, depending on the intensity of the activity.

Adherence to Aerobic Exercise

Exercise Adherence Variables

As noted earlier, a large majority of persons in this country either do not engage in aerobic exercise, or do so in a manner that is not maximally beneficial. Many researchers have looked for variables that might be associated with adherence to or dropout from aerobic exercise, often as it occurs in a structured program. Despite a fair amount of inconsistency of results and methodological questions

(Dishman, 1982; Dishman, 1986; Dishman, Sallis, & Orenstein, 1985; Oldridge, 1982; Martin & Dubbert, 1985) this research generally indicates that smoking status, occupation, convenience, social support, motivation, recreational features of the activity, age, income, and education level may be important variables for exercise adherence.

Heinzelmann and Bagley (1970) examined men at risk for coronary heart disease who participated in a supervised exercise program, and found, among other things, that 80% of the men whose wives had positive attitudes toward the program had "good" or "excellent" adherence patterns, whereas only 40% of those whose wives had negative attitudes had such adherence patterns. Massie and Shephard (1971) studied healthy, sedentary, middle-aged male volunteers participating in group and individual exercise programs, and found that the dropout rate was higher in the individual program than the group program, although the reasons for this were unclear due to confounding variables. In general, dropouts weighed more, carried more excess weight, had greater skinfold thicknesses and percentages of body fat, and were substantially stronger in leg extension and handgrip than were adherers. Moreover, dropouts were more extraverted, less motivated, and more likely to smoke than adherers.

In examining 153 male participants of a 4-year exercise rehabilitation program for myocardial infarction, Oldridge,

Wicks, Hanley, Sutton, and Jones (1978) found that dropouts were significantly more likely than adherers to have had more than one previous myocardial infarction, to have type A behavior patterns, to be inactive in their leisure time, and to smoke. The most common reason provided for dropout was lack of motivation and interest.

Andrew and Parker (1979) investigated 728 male participants of an exercise program, and found that dropouts were significantly more likely than adherers to lack enthusiasm for the program, experience higher levels of fatigue, and feel that the program caused greater inconvenience for them. Dropouts also reported more difficulty relaxing, were more disappointed in their income since their infarction, and perceived that their wives were less supportive. Andrew et al. (1981), in a reanalysis of the Andrew and Parker (1979) data, additionally found that dropouts were significantly more likely than adherers to believe that the exercise sessions interfered with their work, to have a poor impression of the program staff, to not believe that exercise is important for health, and to have heavier work loads.

Oldridge et al. (1983) used two regression analyses to further examine the Andrew and Parker (1979) data. In the first of these persons forced to withdraw due to reinfarction were considered compliers, whereas in the second such persons were considered dropouts. The first analysis showed that

subjects who were smokers, blue collar workers, and had cough and sputum were significantly more likely to drop out. Dropouts were also significantly younger than adherers, and had higher resting systolic blood pressure. The second analysis additionally found that subjects with a history of angina were more likely to drop out than were those without angina. In neither analysis did dropout rates differ as a function of exercise intensity. Dropouts provided the following reasons for their withdrawal: transition--24%; psychosocial--39%; medical--16%; inconvenience--6%; miscellaneous--12%; unknown--2%.

Reasoning that self-motivation should be important for exercise adherence, Dishman, Ickes, and Morgan (1980) developed a self-motivation inventory reflecting the behavioral tendency to persevere or persist in the absence of situational reinforcements. The authors reported two separate studies attesting to the validity and reliability of their inventory. The first involved 64 female college undergraduates who participated in a women's crew training program lasting approximately 8 months, and included self-motivation, ego-strength, and social desirability as predictors of adherence. Only self-motivation significantly distinguished dropouts and adherers. In addition, self-motivation entered a multiple regression equation first, with a correlation coefficient of .33. Inclusion of the other variables did not significantly increase the prediction of

adherence.

The second study consisted of a 20-week investigation of 66 healthy and coronary at-risk adult males enrolled in physical activity programs. The authors included a number of psychological (self-motivation, health locus of control, estimation of and attraction to physical ability, and attitudes toward physical activity) and biological variables (body weight, percent body fat, and metabolic capacity) that seemed intuitively relevant to exercise adherence. A stepwise multiple discriminant analysis revealed that only self-motivation, percent body fat, and body weight significantly distinguished dropouts from adherers, with adherers being leaner and lighter, and having more self-motivation than dropouts. Percent body fat, self-motivation, and body weight entered a stepwise multiple regression equation consecutively and were the only variables that significantly enhanced the prediction of adherence. These variables resulted in a multiple correlation of .67 and accounted for 45% of the adherence variance. The correlation between adherence and self-motivation was .44. Dishman and Gettman (1980) found essentially the same results for these variables, as did Dishman (1981a) for percent body fat and body weight.

Ward and Morgan (1984) further evaluated the "psychobiologic model" of Dishman et al. (1980) (which focused on self-motivation, percent body fat, and body

weight) by examining 76 healthy participants of a 32-week walk/jog fitness program. Using these three variables, the authors reported an overall prediction accuracy of 71% for adherence, but only 25% for dropouts. Regarding other variables considered, it was found that adherers were older, had lower diastolic blood pressure, and performed fewer sit-ups in 1 minute than did dropouts. In addition, adherers had lower scores than dropouts on the Profile of Mood States questionnaire for the variables of tension, depression, anger, vigor, fatigue, and confusion (lower scores imply greater health on these variables).

Tirrel and Hart (1980) explored the relationship of patient health beliefs, knowledge about an exercise regimen, and various demographic variables to compliance with a "heart walk" program. Interviewing 30 persons who had previously undergone coronary artery bypass surgery, the researchers found significant correlations of .36 between heart walk knowledge and heart walk compliance, and of .42 between pulse-monitoring knowledge and pulse-monitoring compliance. Perceptions of barriers to exercise showed the strongest relationship to overall walking compliance. Subjects did not differ in age, sex, education, occupation, marital status, or time elapsed since surgery. In a sample of 123 healthy subjects, Slenker, Price, Roberts, and Jurs (1984) also found that perceived barriers (lack of time, family or job responsibilities, unsuitable weather conditions, and lack of

desire or interest) was the most powerful predictor of the variables they considered, accounting for approximately 40% of the total variance. General health motivation accounted for an additional 8% of the variance.

Holm, Fink, Christman, Reitz, and Ashley (1985) examined 41 cardiac patient graduates of an outpatient exercise program to determine their health beliefs, as well as factors that might influence these beliefs. In terms of health beliefs, the authors found that many subjects believed that their heart condition was severe compared with other illnesses, and that there was a chance of recurrence. In addition, a weak but statistically significant correlation was obtained between perceptions of severity and general health motivation. Subjects also tended to have an external locus of control, and to be satisfied with the exercise program and its staff. Finally, the subjects evidenced self-motivation and social support.

Blumenthal, Williams, Wallace, Williams, and Needles (1982) examined 35 patients referred to a 1-year structured cardiac rehabilitation program involving aerobic exercise. Minnesota Multiphasic Personality Inventory results showed that dropouts exhibited less defensiveness, more emotional distress, and lower ego-strength, than did adherers, and also had higher social introversion, hypochondriasis, and depression scores. In addition, dropouts had significantly lower left ventricular ejection fractions (the amount of end-

diastolic blood volume that is ejected from the heart with each beat) than did adherers. No significant differences were found in age, weight, serum cholesterol, triglycerides, and systolic and diastolic blood pressure.

Gale, Eckhoff, Mogel, and Rodnick (1984) investigated 106 healthy adult volunteers participating in a 6-month exercise program. Attendance scores were related to a large number of physiological, psychological, behavioral, and demographic variables, including level of fitness, smoking status, age, weight, occupation, and self-motivation as measured by Dishman et al.'s (1980) Self-Motivation Inventory. Although the researchers found some differences between adherers and dropouts, they stressed that very little of the variance in attendance could be attributed to the variables considered (the exact amount was not provided), and that none of them was useful in a practical sense in predicting adherence.

Mirotznik, Speedling, Stein, and Bronz (1985) compared 54 healthy adult adherers to, and dropouts from, a 24-week exercise program in terms of six categories of variables: sociodemographic characteristics, physical characteristics, fitness (as assessed by VO^2 max), coronary heart disease risk factors, self-assessed health, and general health attitudes and behavior. In this case, the only variable that distinguished adherers from dropouts was fitness.

McCready and Long (1985), in a sample of healthy women involved in fitness programs, found that the attitude variables of "social continuation" (desire to form and maintain social relations), "catharsis," and "health and fitness: value" (values associated with health and fitness), as well as external locus of control, were significantly related to adherence, accounting for 22% of the adherence variance. Social continuation and catharsis accounted for the bulk of this (16%), indicating that those subjects who at the outset of the program had a less positive attitude toward participating in physical activity for social reasons, and a more positive attitude toward participating in order to reduce stress and tension, tended to achieve greater attendance. None of the demographic, situational, or behavioral variables considered by the authors (age, sex, smoking habits, leisure and work activity, employment status, spouse and family support, and previous exercise behavior) were significantly related to adherence.

Wankel (1985) interviewed male adherers to and dropouts from an aerobically-oriented employee fitness program 8 to 10 months after they had joined. Using a multivariate discriminant analysis, he found that social support (friendship within the program, and encouragement from supervisor and nonwork friends) was more important to adherers than to dropouts, as was a feeling of psychological well-being. In addition, the goals of release of competitive

drive and satisfaction of curiosity about the program were more important for adherers, whereas weight loss and relief of tension and anxiety were more important for dropouts. In terms of program likes and dislikes, the adherers favored the "activity," but disliked physical discomfort and poor leadership continuity. Dropouts, on the other hand, more frequently reported inconvenient time and poor activity selection. Reasons cited for dropping out included inconvenience, loss of interest, and dislike of the rigid schedule.

Desharnais, Bouillon, and Godin (1987) examined the extent to which participants' early impressions of an 11-week supervised physical fitness program could predict subsequent adherence. They assessed 74 men and women who remained in the program at its 5th week in terms of the degrees to which (a) the fitness leader displayed professional interest in participants, (b) participants were satisfied with the way the program was offered, (c) participants perceived tiredness (mental and physical) in performing the prescribed exercises, (d) participants experienced difficulty in accommodating the exercise program with other daily activities, and (e) participants felt supported by other close individuals in continuing with the fitness program. The researchers found that perceived difficulty in accommodating the exercise program to other daily activities accounted for 38% of the total variance, with the other variables contributing about

6% to the total.

Siegel, Johnson, and Newhof (1988) assessed the reasons given by female college students for enrolling in, completing, and/or dropping out of non-credit, non-required exercise and sport classes. At the beginning of the classes, all subjects completed a 20-item questionnaire developed on the basis of a literature review. Dropouts completed a second questionnaire when they dropped a class, and adherers did so at the end of the classes. Factor and discriminant analyses revealed that at the initial assessment adherers were more positive about developing and utilizing skill, using their minds in physical activity, and being involved in social interactions, whereas dropouts were more positive about the health and fitness benefits of participation. At the time of the second assessment, adherers were significantly higher than dropouts on factors representing recreational and social/skill development, whereas dropouts were more likely to favor participation as a means of developing creativity or using one's mind.

Brooks (1988) examined the relationships between sociodemographic variables and physical activity among 19,110 American adults (nearly equal numbers of women and men) drawn from the Simmons Market Research Bureau, Inc. 1984 survey. After dividing respondents into six age groups, she found that only age, education, and income, in order of strength of association, were significantly related to physical activity

levels, the association being negative for age, and positive for education and income. A path model specifying education and income as predictor variables revealed that education was the most important predictor of physical activity level for all age groups except the oldest (65 and older), although the total amount of variance explained by education and income was never greater than 8% (for 35-44 year-olds). Moreover, the amount of variance explained by the model decreased with advancing age.

Exercise Adherence Enhancement Strategies

Oldridge (1982) suggested that it may be more profitable to consider strategies to increase exercise adherence than to focus on predictors of adherence/dropout, and a number of researchers have done so. Methodological limitations notwithstanding (Martin & Dubbert, 1985), this research generally suggests that simple cognitive-behavioral strategies may be useful for promoting the adoption of aerobic exercise, if not its long-term adherence.

Wankel and Thompson (1977) studied the effects of several simple interventions on the attendance of 100 female members of an adult physical fitness club who had been inactive for at least 1 month. They assigned subjects to one of four treatment groups: (a) a no telephone call control; (b) a standard telephone follow-up used by the club for inactive members; (c) a telephone interview in which

subjects were requested to consider anticipated gains and losses to self and others that might result from club participation; and (d) a telephone interview in which subjects were requested to consider only anticipated positive outcomes to self and others resulting form club participation. In the latter two conditions the interviewer responded with encouraging positive feedback as the subjects read items from their lists of anticipated gains and losses. Although attendance over a 1-month period following the intervention was quite low for all groups, analysis of variance (ANOVA) results indicated that the positive and negative outcomes and the positive outcomes-only groups had significantly better attendance than the no-call group, and that the latter group had significantly better attendance than the standard-call group.

In a related study, Wankel, Yardley, and Graham (1985) conducted two studies to examine how the effects of a decision balance sheet procedure and a structured social support program might interact with level of self-motivation to affect program attendance. In both studies subjects were classified according to level of self-motivation (high versus low) by means of Dishman et al.'s (1980) Self-Motivation Inventory before being assigned to treatment groups. The first study matched pairs of 52 women on self-motivation scores and then assigned them to two possible conditions: one in which subjects considered gains and losses to, and

approval and disapproval from, self and significant others, while the interviewer responded with appropriate encouraging comments; or a no treatment control. Subjects then participated in a 5-week introductory physical fitness program. Results showed marginal effects for the decision balance sheet ($p<.07$), but not for self-motivation or its interaction with the balance sheet. The treatment variable in the second study was structured social support (in the form of class, buddy, leader, and home support elements), and results showed significant effects for this variable, although again not for self-motivation or its interaction with social support.

Wysocki, Hall, Iwata, and Riordan (1979) examined the effectiveness of behavioral contracting on exercise in an uncontrolled study. Seven male and five female university students (ages 20 to 33) contracted to earn back items of personal value that had been deposited with the researchers, contingent upon achieving an agreed upon number of "aerobic points" per week, and for recording each other's exercise. The researchers found that weekly aerobic point values increased for seven of the eight subjects who completed the 10-week treatment period. Moreover, at a 1-year follow-up seven subjects were earning more aerobic points than they had during the baseline period.

Reid and Morgan (1979) randomly assigned 124 healthy adult participants of a beginning exercise program to three

treatment conditions: (a) an exercise prescription consisting of printed instructions for exercise and a 10-minute consultation with a physician; (b) the addition to this of a health education program consisting of a 1-hour period of film and discussion supervised by a health educator; and (c) the addition to the latter protocol of pulse self-monitoring, recording of daily exercise behavior, and the reporting of this information. Using a compliance index based on self-report and physiological assessment, the researchers found that the percentage compliance rates for the three groups at the end of 3 months were, respectively, 29%, 56%, and 55%. However, this dropped to 30% for all three groups at a 6-month follow-up.

Using a quasi-experimental design, Brownell, Stunkard, and Albaum (1980) conducted two studies on the effects of a cartoon encouraging the use of stairs at public escalator/stairway choice points on the relative frequency of use of escalators or stairs. The first study employed an ABAB design to assess the effects of intermittent use of the intervention. On the basis of 21,091 observations the researchers found that the cartoon markedly increased the percentage of persons using the stairs across all observation sites and across all categories of subjects. The second study used an ABA design, and on the basis of 24,603 observations the researchers again found that the intervention significantly increased the use of the stairs

during the 3-week observation period. Moreover, increased stair use persisted at a 1-month follow-up, although it returned to baseline levels at the end of a 3-month follow-up.

Atkins, Kaplan, Timms, Reinsch, and Lofback (1984) randomly assigned 78 patients with chronic obstructive pulmonary disease to five experimental groups: (a) behavior modification (contracting, relaxation training, and breathing exercises); (b) cognitive modification (coping self-statements); (c) cognitive-behavior modification (a combination of the behavioral and cognitive strategies); (d) attention control; and (e) no-treatment control. In all but the last condition the experimenter met with the patients individually for seven sessions over the course of 3 months. On the basis of self-reports the researchers found that the three treatment groups differed significantly from the control groups (which did not differ) in walking adherence over the 3-month treatment period. Moreover, they found that the cognitive-behavioral strategy was superior to either the cognitive or the behavioral strategies alone. Results were identical at a 6-month follow-up.

Martin et al. (1984) conducted a series of six studies over a 4-year period to test the effects of behavioral and cognitive interventions on adherence within 10 to 12-week walking/jogging classes for sedentary adults. Subjects exercised twice weekly with instructors, and were required to

exercise one day outside of class. The first study, involving 33 subjects, examined the effects on adherence of four treatments: (a) immediate, personalized feedback/reinforcement; (b) delayed, group feedback/reinforcement; (c) distance-based goals; (d) time-based goals. ANOVA results suggested that when personalized feedback and praise were provided during exercise it made no difference whether the goals were distance or time-based. However, when group feedback was provided those persons with time-based goals had significantly better adherence than those with distance-based goals. Three-month follow-up results showed a decline in adherence in all groups.

The second study found no significant effects for either lottery or flexible goal choice conditions on adherence among 34 subjects. The third study replicated the second, and also tested for order effects of flexible versus inflexible goals, the hypothesis being that participant-established, flexible goals would be especially important in the early stages of acquisition of the exercise habit. In this case, the researchers found that flexible goals produced higher adherence rates than fixed goals among the 15 subjects. The fourth study assessed the effects of proximal (weekly) versus distal (every 5 weeks) goal-setting strategies on the adherence of 24 subjects, and results showed no significant group differences. However, a 3-month follow-up assessment revealed adherence rates of 67% and 33%,

respectively, for the distal and proximal goal subjects.

The fifth study randomly assigned 17 subjects to two cognitive strategies: an "associative" strategy in which subjects focused on bodily sensations while challenging themselves to push harder, and a "dissociative" strategy that emphasized coping thoughts and distraction by means of focusing on the external environment instead of bodily discomfort while running. The researchers found significant effects favoring the dissociative strategy. After 3 months 88% of the dissociative subjects and 38% of the associative subjects reported exercise maintenance.

The final study tested the effects of relapse prevention strategies on exercise maintenance. The researchers assigned 35 subjects to three treatment groups: the dissociative approach mentioned above, a detailed discussion of specific relapse prevention strategies, and the same relapse prevention training along with continued contact following treatment. The researchers found no significant group differences for follow-up adherence at either 3 or 6 months, although methodological difficulties clouded these results.

King and Frederiksen (1984) investigated the effects of relapse prevention training and social support on jogging adherence among female college students. They randomly assigned the subjects to four 5-week treatment conditions: relapse prevention training, social support (jogging groups),

relapse prevention training combined with social support, and control. ANOVA results showed no differences for the relapse prevention-only and social support-only groups, both of which jogged significantly more than the other groups. However, at a 3-month follow-up, 83% of the relapse prevention training-only group members were still jogging, whereas only about 37% of the other group members were doing so.

Belisle, Roskies, and Levesque (1987) studied relapse prevention training among persons involved in beginner-level 10-week exercise groups offered by a university. In their first study, the researchers randomly assigned six such groups to a relapse-prevention training condition, and six to a control condition (total=350 subjects). They found small but significant effects for the treatment in terms of the mean number of sessions attended, although multiple regression results indicated that it accounted for only about 8% of the variance. Treatment effects were still significant at a 3-month follow-up. A second study produced essentially the same results.

Thompson and Wankel (1980) examined the effects of perceived choice of activity on the exercise behavior of 36 healthy adult females who had recently enrolled in a 6-week commercial exercise program. Subjects were matched on activity preferences, and one member of each pair was randomly assigned to either a perceived choice or a perceived no choice control condition. Results showed that although

attendance in both groups declined over the 6-week period, the decline was marginally greater for the no choice group, and this difference became apparent only in the 5th and 6th weeks ($p<.10$). At the end of the treatment period, subjects in the choice condition also expressed a greater intention to continue exercising at the club.

Gettman, Pollack, and Ward (1983) randomly assigned 47 sedentary healthy adult male volunteers to three groups: unsupervised exercise, supervised exercise, and sedentary control. Both exercise conditions followed essentially the same exercise protocol. Attrition rates for the three groups were 35%, 45%, and 30%, respectively, and most of the subjects' reasons for dropout centered on lack of time.

Long and Haney (1986) tested the effects of 1-hour counseling interviews on the initiation of physical activity. They randomly assigned 68 sedentary women to interview-with-information, interview-with-no-information, and wait-list control groups. All subjects were assessed initially in terms of exercise locus of control and values toward physical activity. All interview subjects also reported current exercise patterns, satisfaction with these, and exercise goals for the coming 1-month test period. Information subjects additionally received detailed information on community exercise programs and services. Both treatment groups showed increases over the control group in terms of a composite exercise score (duration-intensity) and goal

achievement, but did not differ from each other. Multiple regression indicated that exercise locus of control and values regarding physical activity predicted increased physical activity only for the control group (the amount of explained variance was 17%).

In investigating self-reported factors influencing exercise adherence, Gillette (1988) randomly assigned 38 middle-aged, overweight female participants of 17-week exercise classes to treatment and control groups. Treatment involved an intensity-controlled format utilizing individualized exercise prescriptions based on each subject's level of fitness. In addition, selected principles of reinforcement were used with this group, such as individual attention from the instructor, social support from the instructor during and after exercise, encouragement of group social support and cohesion, and regular objective feedback about body changes.

The author found that 94% of all subjects adhered to the program, with no group differences in adherence. Self-reported factors that influenced adherence included group homogeneity, social networks and carpooling, pleasurable feelings associated with increased energy and increased fitness, a leader with a health-related background, limited duration of the exercise program, commitment to achieve an established goal, desire to change body image, and desire to change health status and improve physical health problems.

King, Taylor, Haskell, and Debusk (1988) evaluated strategies for enhancing the adoption and maintenance of moderate-intensity, home-based exercise among subjects who had previously participated in a 6-month randomized, controlled study to assess the physiological effects of such training. The 52 subjects for the adoption portion of this study (control subjects in the previous study) received exercise training and instruction in self-directed behavioral strategies, including relapse prevention and self-monitoring, and were then randomly assigned to two groups: one which received support and instruction by means of staff-initiated telephone contacts; and one which did not. Results at 6-month follow-up showed that the VO^2 max of the telephone-contact group was significantly greater than that of the no-contact group, and that this change was significantly associated with self-reported adherence to exercise training.

The 51 maintenance treatment subjects received the same training as the adoption group, and were then randomly assigned to two groups: one which received a list of adherence tips and guidelines, and practiced self-monitoring on a daily basis; and one which practiced self-monitoring on a weekly basis. In this case the daily self-monitoring group reported significantly more exercise sessions per month during the 6-month maintenance period than did the weekly self-monitoring group, although both groups showed significantly increased VO^2 max values at the end of the

maintenance period. Moreover, change in VO^2 max was significantly correlated with the number of exercise sessions reported per month, and ratings of the enjoyment of exercise sessions were positively related to the reported duration and the perceived convenience of the sessions.

Noland (1989) compared self-monitoring with reinforcement administered by a significant other in enhancing adherence to a recommended, unsupervised exercise program. Thirty one adult exercise class graduates (Adult Fitness group [AF]) and 38 sedentary adults recruited from a university newspaper (NEWS group) were blocked on gender; randomly assigned within blocks to self-monitoring, reinforcement, and control groups; and told to engage in aerobic exercise for 18 weeks. Whereas the self-monitoring subjects maintained written records of their aerobic exercise, the reinforcement subjects reported their exercise behavior to a significant other, who maintained a written record and provided a token for aerobic exercise that could later be exchanged for a reward.

The investigator found that the NEWS <u>treatment</u> subjects and all of the AF subjects reported exercising about two times per week for 25 to 30 minutes per session, whereas the NEWS <u>control</u> subjects reported exercising 1.4 times per week for about 18 minutes per session. Noland also found significant improvements in VO^2 max and exercise heart rate for the treatment conditions of the NEWS group over the

control condition. The AF groups did not differ on the physiological measures, but all of these subjects increased in percent body fat at the post assessment, with the largest increase occurring in the control group.

Applications of the Theory of Reasoned Action

Early tests of the theory of reasoned action were promising (e.g., Davidson & Jaccard, 1975; DeVries & Ajzen, 1971; Jaccard & Davidson, 1972; Pomazal & Jaccard, 1976), and further results have been broadly supportive of this theory. A number of investigators have applied all or parts of the model to aerobic exercise behavior, and their results are also largely supportive.

Riddle (1980), in examining the full model, found a correlation between intention to jog and actual jogging behavior of .82. Her other findings also supported the model, with the exception that the correlation between intentions and subjective norm (.43) was lower than that between intention and normative beliefs (.52). Godin and Shephard (1985), studying the potential effects of spousal influences on their mates' intentions to engage in physical activity, found that a combination of demographic variables and theory of reasoned action variables accounted for 49% and 27% of the variance in exercise intentions for husbands and wives, respectively, with attitude being the most highly significant predictor overall.

Godin, Valois, Shephard, and Desharnais (1987) used a path model to test the effectiveness of the theory of reasoned action in predicting proximal (3-week) and distal (2-month) aerobic exercise. The model accounted for 66%, 68%, and 64% of the variance in intention, proximal behavior, and distal behavior, respectively. Past behavior added 6.5% to the variance explained by the theory of reasoned action variables. Valois, Desharnais, and Godin (1988) compared the utility of the Fishbein and Ajzen (1975) and Triandis (1977) models in predicting exercise. In this case, the researchers found that only attitude was significant in predicting the Fishbein and Ajzen (1975) model's intention, which accounted for 32% of the behavior variance. The Triandis (1977) model components (which included "habit," a measure of prior behavior) accounted for 33% of this variance.

In contrast to these results are those of Dzewaltowski (1989), who found that although the relationships posited by the theory of reasoned action obtained in a path model predicting exercise among college students, the model accounted for only about 5% of exercise variation. In a similar study, Dzewaltowski et al. (1989) found almost identical results. However, in both of these studies the weak results for intention in accounting for exercise behavior may have been due to a lack of correspondence between the intention and behavior measures.

As noted earlier, Fishbein and Ajzen (1975) suggested that the theory of reason action variables mediate the past behavior-future behavior relationship. By and large, research results indicate that such may be the case.

In the Dzewaltowski et al. (1989) study noted above, for example, the entry of prior behavior into the path model did not affect the results, whereas the Valois et al. (1988) study showed that intention accounted for nearly as much behavior variance as did a combination of several Triandis (1977) model components, one of which was prior behavior. Moreover, the Godin and Shephard (1985) study cited above found that prior physical activity habits were not related to intentions to exercise. Bentler and Speckart (1981) applied the theory of reasoned action to the studying, dating, and exercise behavior of college students, and found that the addition of intention and subjective norm to a cross-lagged structural model containing attitude and previous behavior improved the prediction of all three behaviors.

Bagozzi (1981) used path models to examine blood donating behavior at university blood drives 1-week (proximal behavior) and 4-months (distal behavior) after the assessment of intentions. Prior behavior consisted of blood donations in the past five years. In this case the addition of past behavior to the most highly predictive path model actually reduced the explained variation in proximal behavior from 22% to 20%, although it increased the explained variation in

distal behavior from 30% to 49%. In keeping with this latter finding, Fredricks and Dossett (1983) found that the path model providing the best fit for their data did not show significant effects for intention beyond those of prior 2-week behavior in predicting the class attendance of college students over a 5-week academic term. However, in both of these studies the results for intention in predicting longer-term behavior are not necessarily surprising, given Ajzen and Fishbein's (1980) caveat that accurate behavioral prediction requires that the assessments of intention and behavior should occur as closely together as possible.

Other investigators have applied the theory of reasoned action to discrete behaviors that have either never occurred or are of such a low frequency that previous behavior could have only a minimal influence on the predicted behavior (Bowman & Fishbein, 1978: voting; Fishbein, Ajzen, & Hinkle, 1980: voting; Gill, Crosby, & Taylor, 1986: voting; Manstead, Profitt & Smart, 1983: infant feeding; Smetana & Adler, 1979: abortion; Vinokur-Kaplan, 1978: family planning). Their results have also generally supported the theory's postulates.

Applications of the Theory of Planned Behavior

Schifter and Ajzen (1985) applied the theory of planned behavior to weight loss among female college students. Presumably, this is a behavior over which people may have

limited control. Multiple regression results showed that perceived behavioral control made an independent contribution in predicting intentions, and that it was the best single predictor of actual weight loss. Ajzen and Madden (1986) applied the model to two behaviors: college class attendance and receiving an "A" in class. Presumably, students should have a high degree of control over the former behavior, but much less over the latter. In both cases, the researchers found that the postulated theoretical relationships held, and that the theoretical variables offered incremental variance beyond prior behavior. Dzewaltowski et al. (1989) examined the physical activity participation of college students--an activity which seems relatively controllable--and found a main effect of perceived behavioral control on intention, although it did not interact with attitude or subjective norm. On the other hand, perceived control did not influence the prediction of physical activity.

Clearly, more research with the theory of planned behavior is needed before definitive statements can be made about its potential utility for understanding aerobic exercise. However, available data suggest that the concept of perceived behavioral control may in some cases increase the explanatory power of the theory of reasoned action.

Applications of Social Cognitive Theory

There has been extensive research on the utility of self-efficacy as a predictor of behavior, and the concept has been found to have wide explanatory power. Generally speaking, percepts of self-efficacy influence behavior choice, effort expenditure, persistence in the face of obstacles, thought patterns, and level of emotional arousal under trying conditions (Bandura, 1986). However, there have been relatively few applications of self-efficacy to exercise adherence.

The Dzewaltowski (1989) study noted above compared the theory of reasoned action with certain social cognitive theory variables (self-efficacy, outcome expectations, and self-evaluated dissatisfaction with the outcomes of behavior) in predicting exercise among undergraduate students enrolled in 8-week physical education classes. Results indicated that the social cognitive variables explained about 14% of exercise variation, with self-efficacy being the strongest predictor; by contrast, the theory of reasoned action accounted for only 5% of the variance. Dzewaltowski et al. (1989), in comparing the theory of reasoned action, the theory of planned behavior, and social cognitive theory, found very similar results for social cognitive theory variables. Of these, self-efficacy alone explained unique variance beyond prior exercise behavior. The Atkins et al. (1984) research cited above found that cognitive, behavioral,

and cognitive-behavioral treatments enhanced self-efficacy expectations in patients with chronic obstructive pulmonary disease, and that increased self-efficacy was associated with greater compliance to walking exercise prescriptions. In a similar study, Kaplan, Atkins, and Reinsch (1984) also found that self-efficacy had positive effects on walking compliance.

In another experimental study, Wurtele and Maddux (1987) assessed the effects of self-efficacy on intentions to exercise in the context of a revised version of protection motivation theory (Maddux & Rogers, 1983; Rogers, 1983). This theory postulates that intentions regarding health behaviors are based upon (a) perceived severity of the depicted harmful event, (b) perceived vulnerability to the threat, (c) perceived effectiveness of an alternative response for preventing the threatening event (response efficacy), and (d) self-efficacy for performing the coping response.

Using a sample of sedentary college women, the researchers found main effects on intentions of perceived vulnerability to the aversive effects of a sedentary life style and perceived self-efficacy, as well as various interaction effects involving vulnerability, response efficacy, and self-efficacy. In terms of actual exercise behavior, the authors found significant effects for the interaction of severity and self-efficacy, such that self-

efficacy was important when severity was not. Multiple regression results showed that self-efficacy was the most powerful predictor of intentions, accounting for 18% of the variance, and that intention was the only significant predictor of exercise behavior, accounting for 9% of the variance. (The relatively low intention-behavior correlation here may have resulted from a lack of correspondence between the intention and behavior measures).

This set of studies suggests that self-efficacy beliefs contribute to an understanding of exercise behavior. As noted earlier, Bandura (1986) considered the distinction between self-efficacy beliefs and outcome expectations to be important, and he suggested that the latter should not add much to the prediction of behavior beyond the former. A number of investigators have pursued this hypothesis (Barling & Beattie, 1983; Desharnais, Bouillon, & Godin, 1986; Dzewaltowski, 1989; Dzewaltowski et al., 1989; Godding & Glasgow, 1985; Lee, 1984; Maddux, Norton, & Stoltenberg, 1986; Maddux & Rogers, 1983; Manning & Wright, 1983). Results generally support Bandura's (1986) postulate, although lack of consensus regarding the definition and measurement of outcome expectancy clouds the issue somewhat.

As with the theories of reasoned action and planned behavior, the question of the relative effects of self-efficacy and past behavior in predicting future behavior is

important, and a number of investigators have included this consideration as part of their self-efficacy research. Although further work is needed to delineate these relationships, prior research generally suggests that self-efficacy expectancies compare favorably with past behavior in predicting future behavior. Dzewaltowski et al. (1989), for example, found that the addition of prior exercise behavior into their statistical analyses did not affect the results for self-efficacy.

Bandura and Adams (1977), in exploring self-efficacy beliefs among snake phobics, found that almost all of their subjects initially failed at the same level of snake avoidance tasks, and that although they successfully completed these tasks following a treatment involving participant modeling, they varied considerably in their subsequent performance on additional tasks. This suggests that previous performance was of limited value in predicting future performance. On the other hand, self-efficacy judgments predicted future performance in 92% of the total assessment tasks. In a similar experiment Bandura, Reese, and Adams (1982) obtained comparable results. Bandura, Adams, Hardy, and Howells (1980) compared the relative efficiency of previous performance and self-efficacy judgments in predicting agoraphobics' post-treatment performance, and found that the "main discrepancy between performance attainments in the field treatment and test

performance (26%) was more than double the discrepancy between perceived efficacy and test performance (10%)" (p. 59).

DiClemente (1981) examined the relative effectiveness of self-efficacy judgments and past behavior in predicting future smoking behavior, and found that subjects who succeeded or failed at smoking abstinence at a 5 month follow-up did not differ on demographic and smoking history variables. However, the two groups did differ in terms of self-efficacy. In another smoking cessation study, DiClemente, Prochaska, and Gibertini (1985) found that self-efficacy judgments had predictive utility for persons who were contemplating smoking cessation or who had quit smoking on a short-term basis, but not for persons who had relapsed. A small correlation between self-efficacy and several past smoking behavior variables suggested to the researchers that the effects of self-efficacy were largely independent of past smoking behavior. Similarly, Kendrick, Craig, Lawson, and Davidson (1982), in testing the effects of three treatments on musical performance anxiety, found that self-efficacy expectations were positively correlated with improvements in behavioral indices of performance anxiety at 5-week follow-up; by contrast, immediate posttreatment performance (error-count) did not correlate with follow-up behavior.

Lee (1982) compared the effects of self-efficacy for performance, coach's expectancy for performance, and previous

competition scores in predicting the gymnastic competition scores of 14 young girls. Although the coach's and gymnasts' predictions were each significantly correlated with the competition score received (*r*'s of .79 and .55, respectively), previous scores were not (*r* = .34). In addition, self-efficacy was not correlated with previous performance. However, caution is warranted in interpreting these findings, given the vary small *N* for correlational analyses.

Other researchers have found that self-efficacy offers no improvement over past behavior in predicting future behavior. For example, McIntyre, Lichtenstein, and Mermelstein (1983) collected smoking status data both during smoking-cessation treatment and at 1-month, 3-month, 6-month, and 1-year follow-ups. They found that "when all subjects are considered, end-of-treatment smoking status is a better predictor of follow-up than self-efficacy" (p. 633). In testing Bandura's (1977) postulate that physiological arousal and past performance accomplishments affect future performance primarily via self-efficacy perceptions, Feltz (1982) examined modified back-dive performance executed in four consecutive trials. Using path models, she found that although self-efficacy, past performance accomplishments, and past diving performance all significantly predicted subsequent diving performance, the effect of past performance increased over trials, whereas that of self-efficacy

decreased. In effect, self-efficacy was a better predictor of diving performance only for the first dive attempt, after which the previous dive attempt became the better predictor. In a replication of this study, Feltz and Mugno (1983) obtained similar results.

Woolfolk, Shane, Gottesfeld, and Aitken (1985) assessed self-efficacy expectations in their investigation of the effects of mental imagery on golf ball putting performance. Subjects alternately rated their self-efficacy for putting performance and then engaged in putting trials. The authors found significant correlations between self-efficacy and subsequent putting performance, although these correlations became lower with each successive putting trial; once the effects of previous putting performance were controlled, the correlations of self-efficacy and subsequent performance became insignificant.

Social Support as a Factor in Adherence to Aerobic Exercise

The relationship between social support and health consequences has been an important consideration to health psychologists. Gentry and Kobasa (1984), for example, stated that social support is the "resource most often cited in the behavioral medicine literature that describes the ability of humans to survive the unhealthy consequences of various types of environmental stress..." (p. 93). Although methodological limitations preclude definitive conclusions (Coyne & Bolger,

1990; Gottlieb, 1981; Sandler & Barrera, 1984; Sarason, Sarason, & Pierce, 1990), researchers have found that social support may be important, for example, in reducing the risk of all-cause mortality in adults (Berkman & Syme, 1979; Blazer, 1982; Gallo, 1982; Gove, 1973), and in mediating the effects of breast cancer (Edwards, Cooper, Pearl, & de Paredes, 1990; Funch & Marshall, 1982; Levy, Herberman, Whiteside, & Lonzo, 1990). It also may be associated with overall health status (Schwarzer & Leppin, 1989), serve as a buffer of stressful life events (Cohen, McGowan, Fooskas, & Rose, 1984; Jayaratne, Tripodi, & Chess, 1983; Kamal, Phil, & Lain, 1988), and be a factor in modifying health-related behaviors (Coletti & Brownell, 1982; Hanson, Isacsson, Jansen, & Lindell, 1990; Orth-Gomer & Undin, 1990; Van Roosmalen & McDaniel, 1989; Wills & Vaughan, 1989). In addition, social support may be important in reducing psychological distress (Flannery & Wieman, 1989), anxiety in men (Medalie & Goldbourt, 1979), and depression in the elderly (Palinkas, Wingard, & Barrett-Connor, 1990).

As noted earlier, a number of studies have indicated that social support may contribute to exercise adherence. For example, wives' attitudes toward an exercise program appear to be positively related to their husbands' participation in it (Andrew & Parker, 1979; Heinzelmann & Bagley, 1970). The encouragement of professional staff may enhance the initiation of exercise (King et al., 1988),

whereas that of fellow participants may reinforce its maintenance (King & Frederiksen, 1984; Wankel et al., 1985). Moreover, general support from one's social environment may influence adherence to exercise programs (Holm et al., 1985; Wankel, 1985). Accordingly, the present study assessed this variable in an effort to construct predictive models that explain as much variance as possible in exercise behavior.

Summary

This review indicates that aerobic exercise has a number of beneficial effects on human physiological and psychological functioning. Despite methodological limitations and some inconsistency, the adherence literature suggests that smoking status, job type, convenience, motivation, recreational features of the activity, age, income, and education level may be important variables for adherence to aerobic exercise, and that simple cognitive-behavioral strategies may be useful for promoting its adoption.

The review also suggests that the theory of reasoned action has proven useful for explaining exercise behavior, and that its effects are generally independent of, and frequently go beyond, those of previous behavior in predicting future aerobic exercise. Furthermore, its extension, the theory of planned behavior, has shown promise in enhancing the original theory's explanatory power. Self-

extension, the theory of planned behavior, has shown promise in enhancing the original theory's explanatory power. Self-efficacy expectations, and possibly to a lesser extent, outcome expectations, also seem to be useful in explaining exercise behavior, and self-efficacy's effects also compare favorably with previous behavior in predicting future behavior. Finally, perceived social support may influence the adoption of, and adherence to, programs of aerobic exercise.

CHAPTER 3

Method

Subjects

Subjects for this study consisted of 284 students drawn from the subject pool of the Department of Psychology, Michigan State University. All of the students were enrolled in introductory psychology courses, and received experimental credits for their participation in this research study.

Procedure

Ajzen and Fishbein (1980) indicated that because intentions can change over time, accurate behavioral prediction requires that the measurement of intention occur as closely as possible to the behavioral observation. For this study, 1 week was, by definition, the minimum amount of time necessary for the behavior of interest to occur, and therefore this time interval was utilized for the assessment of intention to engage in aerobic exercise and actual future aerobic exercise behavior.

Ajzen and Fishbein (1980) also indicated that accurate prediction requires that all measures for the theoretical variables should correspond exactly in terms of the elements

of action, target, context, and time. In this study, the action element was aerobic exercise behavior, and the target was the various outcomes of aerobic exercise as perceived by the subjects. Although the contextual element was not important for this study (that is, it did not matter under what circumstances subjects engaged in aerobic exercise) the time element consisted of aerobic exercise engaged in for a minimum of 20 minutes per session for at least three days of the 1-week test period.

In keeping with Bandura's (1986) dictate that "measures of self-percepts must be tailored to the domain of psychological functioning being explored" (p. 396), the social cognitive theory variables of self-efficacy and outcome expectations were also assessed at levels of specificity that were similar to those of the theories of reasoned action and planned behavior.

Assessment of the predictor variables was accomplished by means of a closed-format questionnaire which used 3-item scales to assess intention, attitude, subjective norm, and perceived behavioral control. Because previous research generally supported the theoretical relationships between behavioral beliefs and attitudes, between normative beliefs and subjective norm, and between control beliefs and perceived behavioral control (Ajzen & Madden, 1986; Bowman & Fishbein, 1978; Dzewaltowski, 1989; Fishbein et al., 1980; Gill et al., 1986; Godin et al., 1989; Schifter & Ajzen,

1985), behavioral, normative, and control beliefs were not assessed. However, the social cognitive theory variables of outcome expectancies and evaluations of outcomes (the theoretical equivalents of Ajzen & Fishbein's, 1980, behavioral beliefs and evaluations) were each assessed using 13-item scales. Self-efficacy for adherence to aerobic exercise and perceived social support were both assessed using 6-item scales.

As much as possible, the various scale items were interspersed in the questionnaire in a manner that minimized the potential for bias resulting from answering, for example, three consecutive similar questions. The questionnaire also assessed subjects' age, sex, race, year in school, prior aerobic exercise participation, height, weight, smoking status, and health status. An informed consent form was also be included (see Appendix B). The questionnaire thus consisted of a total of 60 items (See Appendix C). It was administered to the subjects in two group testing sessions separated by 1 week, with actual exercise participation being assessed on the second of these occasions. All data were obtained by means of self-report.

Measures

Theory of Reasoned Action

Behavioral Intention

Following Ajzen and Fishbein's (1980) recommendation, behavioral intention was measured in terms of subjective probability (likelihood) of engaging in aerobic exercise. The following three items, numbers 1, 21, and 37 on the questionnaire, were used for this purpose:

I intend to engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week.

I will engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week.

I plan on engaging in aerobic exercise for at least 20 minutes per session for at least three days of the coming week.

Each item had a seven-increment semantic differential format, with endpoints of extremely likely and extremely unlikely, and a midpoint of neither. Score values ranged from plus three for extremely likely to minus three for extremely unlikely, with neither having a value of zero. The sum of the responses to these items served as the measure of intention. Previous evidence of reliability (as assessed by internal consistency [Cronbach, 1951]) appeared adequate for intention measures similar to that used here (Dzewaltowski, 1989; Dzewaltowski et al. 1989; Ajzen & Madden, 1986; Schifter & Ajzen, 1985).

Attitude

Ajzen and Fishbein (1980) indicated that attitude may be estimated by assessing the subject's judgment that a behavior is, for example, good or bad. In this study attitude was measured in this manner using three seven-increment semantic differential items having endpoints as indicated:

For me to engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week is...good-bad.

For me to engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week is...beneficial-harmful.

For me to engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week is...desirable-undesirable.

The scale consisted of items 2, 18, and 38 on the questionnaire, and it was scored in the same manner as was intention. The sum of the items represented the subject's attitude toward aerobic exercise. Schifter and Ajzen (1985) obtained an alpha coefficient of .82 for a similar attitude scale employing these evaluative dimensions.

Subjective Norm

Three seven-increment semantic differential items, having endpoints as indicated, were used to assess subjective norm:

Most people who are important to me think I should engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week. likely-unlikely

The people whose opinions I value most believe I should engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week. likely-unlikely

Those people who mean the most to me believe that I should engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week. likely-unlikely

These items, numbers 3, 19, and 35 on the questionnaire, followed the same scoring format as intention and attitude, and their sum represented the subject's subjective norm regarding aerobic exercise. One-week test-retest reliability and internal consistency for this scale, and each of the others, were assessed as part of this research (see Chapter Four).

Theory of Planned Behavior

Perceived Behavioral Control

The following scale items, numbers 4, 20, and 36 on the questionnaire, were derived from Ajzen and Madden (1986), and formed the scale for perceived behavioral control.

How much control do you have over whether you do or do not engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week? complete control-very little control

It is mostly up to me whether I engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week. agree-disagree

If I wanted to I could engage in aerobic exercise for at least 20 minutes per session for at least three days of the coming week. agree-disagree

The scoring format was the same as for the theory of reasoned action variables, and the sum of the items represented the subject's degree of perceived behavioral control. Using a similar scale, Dzewaltowski et al., (1989) obtained an alpha coefficient of .87.

Social Cognitive Theory

Self-efficacy Beliefs

Bandura (1986) indicated that efficacy beliefs may vary along several important dimensions. The first of these is level, which refers to the degree to which people feel capable of performing tasks of varying difficulty. A second dimension is generality, such that "People may judge themselves efficacious only in certain domains of functioning or across a wide range of activities and situations" (Bandura, 1986, p. 396). The third dimension is strength, such that "Weak self-percepts of efficacy are easily negated by disconfirming experiences, whereas people who have a strong belief in their own competence will persevere in their coping efforts despite mounting difficulties" (Bandura, 1986, p. 396).

This investigation was concerned only with strength of self-efficacy, which was assessed with a self-efficacy for adherence to exercise scale based on that of Dzewaltowski

(1989). Following the practice of Bandura and Adams (1977), Dzewaltowski (1989) had subjects rate the strength of their self-efficacy expectations on a 100-point probability scale, with 10-unit intervals ranging from high uncertainty to complete certainty. For convenience, this investigation employed a 10-point probability scale with 1-unit intervals and endpoints of completely uncertain and completely certain. Bandura (1984) indicated that "Self-percepts of efficacy are typically measured in terms of variable use of the subskills one possesses under different situational demands" (p. 233). Accordingly, Dzewaltowski (1989) assessed strength of self-efficacy in terms of the following potential barriers to engaging in aerobic exercise: work schedule, physical fatigue, boredom related to engaging in aerobic exercise, minor injuries, other time demands, and family responsibilities. The complete scale thus consisted of six items--numbers 39 through 44 on the questionnaire. Dzewaltowski (1989) reported a minimum alpha coefficient of .80 for all of the instruments of his study, including self-efficacy.

Outcome Expectations

Bandura (1977, 1986) has not provided clear guidelines for the assessment of outcome expectations, and the literature provides no consensus in this regard. There are, however, several indications that he assumed an expectancy-

value formulation for outcome expectancies. For example, in discussing the role of competence in efficacy regulation of behavior, he stated

> Individuals may possess the appropriate skills and a strong sense of efficacy that they can execute them well but still choose not to perform the activities because they have no incentive to do so. Self-efficacy therefore does not come into play unless there is some reason to perform a behavior (Bandura, 1978, p. 250).

Elsewhere, in discussing the relationship between self-efficacy and outcome expectations, he argued that "it is because people see outcomes as contingent on the adequacy of their performances, and care about those outcomes, that they rely on self-judged efficacy in deciding which courses of action to pursue" (Bandura, 1986, p. 392). Accordingly, this investigation assumed an expectancy-value formulation for outcome expectancies.

In a pilot study based on Ajzen and Fishbein's (1980) guidelines, Dzewaltowski (1989) found that college students had 13 behavioral beliefs in regard to "participating in active sports or vigorous physical activities for at least 20 to 30 minutes, hard or intense enough to raise your heart rate to 60% of your capabilities and for at least three times per week for the next 8 weeks": would be healthy, would relieve tension, would help me reach my ideal weight, would help me be physically fit, would help me feel better, would improve my mental alertness, would improve my physical appearance, would improve my muscle tone, would help me meet

people, would be time consuming, would be physically injurious, would be boring, would cost money (pp. 254-255). Because Ajzen and Fishbein's (1980) behavioral beliefs represent one's beliefs about the outcomes of a given behavior, and are thus the theoretical equivalent of Bandura's (1986) outcome expectations, the 13 behavioral beliefs found by Dzewaltowski (1989) were used in this study to assess outcome expectations.

Specifically, subjects were asked to indicate their subjective probabilities (belief strength) on a likely-unlikely basis that their performing aerobic exercise would lead to each of the 13 outcomes noted above. In addition, they were asked to evaluate each of these outcomes on a good-bad basis. Both scales had score values ranging from plus three for extremely likely and extremely good, respectively, to minus three for extremely unlikely and extremely bad, respectively. The neither point had a value of zero. The value portion of this scale consisted of items 5 through 17 on the questionnaire, whereas the belief portion consisted of items 22 through 34. As noted above, Dzewaltowski (1989) reported a minimum alpha coefficient of .80 for all of the instruments of his study.

Perceived Social Support

Perceived social support was assessed by means of a six-item scale developed by Clearing-Sky (1986). This scale

employed a five-increment Likert format with endpoints of never and very often regarding such questions as "Do people close to you let you know they believe your thoughts about exercising are okay?" (Clearing-Sky, 1986, p. 111). Score values ranged from zero for never to five for very often. A social support score was derived by totaling the scores for the six items, numbers 45 through 50 on the questionnaire. Clearing-Sky (1986) reported a 10-day test-retest reliability of .73 for this instrument, and Cronbach alpha coefficients of .86 and .88 for the instrument when used in the first and tenth weeks of her study, respectively.

Future Exercise Behavior

In order to assess actual participation in aerobic exercise, item 61 on the questionnaire asked of the subjects at the end of the 1-week test period: "Did you engage in aerobic exercise during the past week (the seven day period beginning one week ago today, and including today)?" A definition and examples of aerobic exercise were provided.

Past Aerobic Exercise Behavior

To assess prior aerobic exercise behavior, item 51 on the questionnaire asked subjects to indicate how many of the past 4 weeks they had engaged in aerobic exercise. A specific definition of aerobic exercise was provided, along with a number of examples of such exercise.

Hypotheses and Data Analyses

Although evidence of reliability appeared to be adequate for measures similar to those used in this research (Ajzen & Madden, 1986; Bagozzi, 1981; Clearing-Sky, 1986; Dzewaltowski, 1989; Dzewaltowski et al. 1989; Fredricks & Dossett, 1983; Godin & Shephard, 1985; Godin et al. 1987; Schifter & Ajzen, 1985), additional data regarding the test-retest reliability and internal consistency of all the instruments was obtained by administering the research inventory both at the beginning and at the end of the 1-week test period. A significance level of .05 was observed conventionally for all of the hypothesis tests except those pertaining to the fit of the logistic regression models used to predict aerobic exercise. In those cases values greater than .05 implied good model fit (See Chapter Four). The statistical computer program Statistical Package for the Social Sciences (SPSS, 1990) was used for all statistical data analyses.

Prediction of Intention

Theory of Reasoned Action

Hypothesis 1: Intention will be significantly predicted from a combination of attitude and subjective norm, controlling for prior behavior.

Test: -Statistical analysis: hierarchical linear regression

-Independent variables, in order of entry: prior

behavior, attitude, subjective norm

-Dependent variable: intention

Theory of Planned Behavior

Hypotheses 2: Perceived behavioral control will add significant incremental variance to the prediction of intention above and beyond that of prior behavior, attitude and subjective norm.

Test: -Statistical analysis: hierarchical linear regression

-Independent variables, in order of entry: prior behavior, attitude, subjective norm, perceived behavioral control

-Dependent variable: intention

Hypothesis 3: Perceived behavioral control will interact with attitude and subjective norm in predicting intention, controlling for prior behavior.

Test: -Statistical analysis: hierarchical linear regression

-Independent variables, in order of entry: prior behavior, attitude, subjective norm, perceived behavioral control, attitude x subjective norm, attitude x perceived behavioral control, subjective norm x perceived behavioral control, attitude x subjective norm x perceived behavioral control

-Dependent variable: intention

Social Cognitive Theory

Hypotheses 4: Intention will be significantly predicted from a combination of self-efficacy and outcome expectations, controlling for prior behavior.

Test: -Statistical analysis: hierarchical linear regression
-Independent variables, in order of entry: prior behavior, self-efficacy, outcome expectations
-Dependent variable: intention

Hypothesis 5: Self-efficacy will exceed outcome expectations in predicting intention.

Test: -Hierarchical linear regression
-Independent variables: self-efficacy and outcome expectations alternately entered first into two linear regression equations
-Dependent variable: intention

Perceived Social Support

Hypothesis 6: Perceived social support will significantly predict intention above and beyond prior behavior.

Test: -Hierarchical linear regression
-Independent variables, in order of entry: prior behavior, perceived social support
-Dependent variable: intention

Prediction of Aerobic Exercise

Theory of Reasoned Action

Hypothesis 7: Intention will significantly predict aerobic exercise, controlling for prior behavior.

Test: -Hierarchical logistic regression
-Independent variables, in order of entry: prior behavior, intention
-Dependent variable: aerobic exercise

Theory of Planned Behavior

Hypotheses 8: Perceived behavioral control will significantly predict aerobic exercise, controlling for prior behavior and intention.

Test: -Statistical analysis: hierarchical logistic regression
-Independent variables, in order of entry: prior behavior, intention, perceived behavioral control
-Dependent variable: aerobic exercise

Hypothesis 9: Perceived behavioral control will interact with intention in predicting aerobic exercise, controlling for prior behavior.

Test: -Statistical analysis: hierarchical logistic regression
-Independent variables, in order of entry: prior behavior, intention, perceived behavioral control,

intention x perceived behavioral control

-Dependent variable: aerobic exercise

Social Cognitive Theory

Hypothesis 10: Self-efficacy and outcome expectations will significantly predict aerobic exercise, controlling for prior behavior.

Test: -Statistical analysis: hierarchical logistic regression

-Independent variables, in order of entry: prior behavior, self-efficacy, outcome expectations

-Dependent variable: aerobic exercise

Hypothesis 11: Self-efficacy will exceed outcome expectations in predicting aerobic exercise.

Test: -Statistical analysis: hierarchical logistic regression

-Independent variables: self-efficacy and outcome expectations alternately entered first into two regression equations

-Dependent variable: aerobic exercise

Perceived Social Support

Hypothesis 12: Perceived social support will significantly predict aerobic exercise, controlling for prior behavior.

Test: -Statistical analysis: hierarchical logistic regression

-Independent variables, in order of entry: prior behavior, perceived social support

-Dependent variable: aerobic exercise

Theory Comparisons

Hypothesis 13: The theoretical constructs and perceived social support will differ in terms of their predictive variance regarding intention.

Test: Comparison of the R^2s of hypotheses 1-6.

Hypothesis 14: The theoretical constructs and perceived social support will complement one another in explaining intention, yielding a higher R^2 than any of the models considered alone.

Test: -Statistical analysis: stepwise multiple linear regression using all of the separate constructs as independent variables, controlling for prior behavior.

-Dependent variable: intention

Hypothesis 15: The theoretical constructs and perceived social support will differ in terms of their predictive variance regarding aerobic exercise.

Test: Comparison of pseudo R^2s of hypotheses 7-12.

Hypothesis 16: The theoretical constructs and perceived social support will complement one another in explaining aerobic exercise, yielding a higher pseudo R^2 than any of the individual constructs considered alone.

Test: -Statistical analysis: stepwise logistic regression using all of the separate constructs as independent variables, controlling for prior behavior.

-Dependent variable: aerobic exercise

The effects of past behavior on future behavior can be controlled statistically by partialling out its particular effects, or methodologically by employing a research design in which previous and/or current behavior can have only minimal impact on the predicted behavior. This research used both methods, obtaining statistical control in the primary analyses by entering prior behavior first into the appropriate regression equations, and methodological control in supplementary analyses by distinguishing those subjects who indicated regular prior aerobic exercise from those who did not.

Power Analysis

The power analysis calculated for this study was based on the hypothesis tests involving linear regression equations. According to Cohen (1988) "The power of a statistical test of a null hypothesis is the probability that it will lead to the rejection of the null hypothesis, i.e., the probability that it will result in the conclusion that the phenomenon exists" (p. 4). He pointed out that statistical power is a function of "three parameters: the significance criterion, the reliability of the sample results, and the 'effect size,' that is, the degree to which the phenomenon exists" (p. 4). The researcher has complete control over the first of these parameters, and, to the extent that he or she can determine sample size, over the second as well. To estimate an appropriate effect size for a given parameter, Cohen (1988) recommended two strategies: (a) appeal to theory and review of the relevant literature; (b) appeal to convention, for example, "small," "medium," and "large" (for multiple regression, he suggested respective R^2 values for these of .02, .13, and .26). He further suggested that one adopt a power value of .80. Using his procedures, if one assumes an effect size of .13 for prior behavior and the ten theoretical variables in predicting intention, and an alpha level of .05, a sample size of 284 yields a power level in excess of .995.

Cohen and Cohen (1983) pointed out that because the experimentwise Type I error rate depends on the number of hypotheses tested rather than sample size, the potentially high power provided by a large sample may be offset by a large number of predictor variables. However, they indicated that in regression analyses this problem can be minimized by entering related variables as sets, which then serve as the primary units of analysis. Accordingly, in supplementary predictive analyses, in which prior behavior was controlled methodologically (see Chapter Four), the research variables were entered as sets according to the theory from which they derived: the theory of planned behavior, social cognitive theory, and perceived social support (for convenience, and because the theory of reasoned action is subsumed in the theory of planned behavior, analyses were conducted only with the latter theory). This procedure, in effect, reduced the number of theoretical predictor variables for intention from ten to three.

CHAPTER 4

Results

This chapter presents the results of the statistical analyses conducted for this study. Specifically, it examines characteristics of the sample and instruments utilized, reports correlations among the major variables, and presents results of the hypotheses tests and supplementary analyses.

Characteristics of the Sample

Data for this study were obtained from 284 psychology students for whom participation in research was a requirement, and were collected at six separate periods during 1990, as noted in Table 4.1. A multivariate analysis of variance (MANOVA) indicated that there were no overall

Table 4.1. Dates and *n*s for the periods at which data were collected.

Period	Date	n
One	April 25-May 2	45
Two	May 9-May 16	25
Three	May 23-May 30	39
Four	October 1-October 8	113
Five	October 15-October 22	13
Six	October 29-November 5	49
	Total =	284

significant differences among the predictor variables (intention, attitude, subjective norm, perceived behavioral control, self-efficacy, outcome expectations, and social support) as a function of the different testing periods (Hotellings F [35, 1352] = 1.26, $p<.14$). Thus, the ns for the periods were combined to form a single sample.

Table 4.2 provides frequencies and percentages, or means and standard deviations (SD), describing the demographic characteristics of the subjects. As can be seen, the "typical" subject in this study was a nineteen-year-old nonsmoking white female freshman who was five feet seven inches tall, weighed 141 pounds, and considered herself to be in good health.

Instrument Reliabilities

Table 4.3 displays Cronbach's alpha coefficients and 1-week test-retest reliabilities for the instruments used to represent the theoretical predictor variables of this study. These data suggest that the instruments generally possess satisfactory reliability, though Cronbach estimates for attitude, perceived behavioral control, and outcome expectations are not optimal.

Table 4.4 presents the means and standard deviations of the scores obtained from these instruments, as well as their possible score ranges. The obtained scores indicate that on

Table 4.2. Demographic characteristics of subjects.

Variable	Frequency	Percent	Mean	SD
Sex				
Female	191	67.3	----	----
Male	93	32.7	----	----
Race*				
Black	13	4.6	----	----
White	257	90.5	----	----
Asian/Pacific	12	4.2	----	----
Hispanic	1	.4	----	----
Year in School				
Freshman	117	41.2	----	----
Sophomore	83	29.2	----	----
Junior	57	20.1	----	----
Senior	26	9.2	----	----
Graduate Student	1	.4	----	----
Smoking Status				
Smoker	38	13.4	----	----
Nonsmoker	246	86.6	----	----
Health Status				
Excellent	92	32.4	----	----
Good	168	59.2	----	----
Fair	23	8.1	----	----
Poor	1	.4	----	----
Age	----	----	19.45	2.29
Height (in Inches)	----	----	67.03	3.61
Weight (in Pounds)	----	----	140.94	26.69

*One subject refused to provide her race.

average subjects intended to engage in aerobic exercise, had positive attitudes toward it, to a small extent believed that important people in their lives felt that they should engage in it, and fairly strongly believed that they had control over whether or not they did so. Moreover, they generally believed that they could engage in aerobic exercise despite

Table 4.3. Cronbach alpha coefficients and 1-week test-retest reliabilities for instruments.

Variable	Cronbach Alpha Coefficient	Test-Retest Reliability
Intention	.97	.83
Attitude	.74	.73
Subjective Norm	.93	.80
Perceived Behavioral Control	.68	.69
Self-Efficacy	.83	.76
Outcome Expectations	.73	.80
Perceived Social Support	.87	.88

Table 4.4 Means, standard deviations, and ranges for scales.

Variable	Range	Mean	SD
Intention	-9 to +9	3.4	5.9
Attitude	-9 to +9	5.5	3.4
Subjective Norm	-9 to +9	1.7	4.8
Perceived Behavioral Control	-9 to +9	6.9	2.8
Self-Efficacy	6 to 60	38.3	12.6
Outcome Expectations	-117 to +117	43.2	25.3
Social Support	0 to 30	15.1	7.0

various barriers to doing so, had somewhat positive expectations about the consequences of engaging in aerobic exercise, and to a moderate degree felt supported by people close to them for engaging in such exercise.

Descriptive Data for Exercisers and Nonexercisers

MANOVA results indicated differences on the primary predictor variables for subjects who indicated that they had engaged in aerobic exercise over the 1-week research follow-up period ("exercisers") and those who indicated that they had not ("nonexercisers"), Hotellings F (7, 276) = 23.5, $p<.001$. Table 4.5 presents t-test results for these variables.

The results indicate that exercisers intended to engage in aerobic exercise, whereas nonexercisers did not, and that although both groups held positive attitudes toward aerobic exercise, those of exercisers were significantly more positive. Moreover, exercisers believed to some extent that important people in their lives wanted them to engage in aerobic exercise, whereas nonexercisers did not, and both groups rather strongly believed that they had control over whether or not they could engage in aerobic exercise. Exercisers also had stronger self-efficacy beliefs and outcome expectations regarding aerobic exercise than did nonexercisers, and felt somewhat more support from important people in their lives for engaging in aerobic exercise than did nonexercisers.

Table 4.5. *t*-test results for predictor variables for exercisers and nonexercisers (two-tailed).

Variable	Mean	SD	t-value	df	p
Intention					
Exercisers*	6.0	4.0			
Nonexercisers**	-1.5	5.9	-12.7	282	.001
Attitude					
Exercisers	6.6	2.4			
Nonexercisers	3.4	3.8	-8.7	282	.001
Subjective Norm					
Exercisers	2.9	4.1			
Nonexercisers	-.5	5.3	-6.0	282	.001
Perceived Behavioral Control					
Exercisers	7.0	2.5			
Nonexercisers	6.7	3.2	-.8	282	.40
Self-Efficacy					
Exercisers	41.5	11.6			
Nonexercisers	32.2	12.3	-6.3	282	.001
Outcome Expectations					
Exercisers	48.7	24.8			
Nonexercisers	32.8	23.0	-5.3	282	.001
Social Support					
Exercisers	16.3	6.6			
Nonexercisers	12.9	7.2	-4.0	282	.001

*n=186, **n=98

Intercorrelation Matrix for the Variables

Table 4.6 displays the intercorrelation matrix for the predictor variables and pertinent interactions among them. Prior behavior in the past month (0 to 4 weeks) and the outcome variable, actual engagement in aerobic exercise, are also included.

Table 4.6. Intercorrelations between predictor variables, relevant interactions, prior behavior, and participation in aerobic exercise.

Variable	I	A	SN	PBC	AxSN	AxPBC	SNxPBC	AxSNxPBC	IxPBC	SE	OE	SS	PB
A	.76***												
SN	.42***	.46***											
PBC	.12*	.21***	.08										
AxSN	.31***	.31***	.81***	.04									
AxPBC	.63***	.83***	.37***	.51***	.29***								
SNxPBC	.38***	.39***	.91***	.02	.77***	.40***							
AxSNxPBC	.32***	.33***	.76***	.19**	.92***	.34***	.80***						
IxPBC	.91***	.68***	.38***	.17**	.31***	.73***	.42***	.33***					
SE	.59***	.52***	.29***	.23***	.24***	.48***	.22***	.24***	.52***				
OE	.54***	.64***	.37***	.21***	.34***	.58***	.35***	.37***	.53***	.41***			
SS	.33***	.30***	.46***	-.11	.41***	.25***	.45***	.36***	.33***	.17***	.29***		
PB	.68***	.51***	.31***	.01	.28***	.40***	.26***	.26***	.62***	.49***	.42***	.35***	
FB	.60***	.46***	.34***	.05	.25***	.39***	.29***	.23***	.54***	.35***	.30***	.23***	.60***

*p<.05, **p<.01, ***p<.001.

I = Intention
A = Attitude
SN = Subjective Norm
PBC = Perceived Behavioral Control
SE = Self-Efficacy
OE = Outcome Expectations
SS = Social Support

AxSN = Interaction of Attitude and Subjective Norm
AxPBC = Interaction of Attitude and Perceived Behavioral Control
SNxPBC = Interaction of Subjective Norm and Perceived Behavioral Control
AxSNxPBC = Interaction of Attitude, Subjective Norm, and Perceived Behavioral Control
IxPBC = Interaction of Intention and Perceived Behavioral Control
PB = Prior Behavior in the Past Month
FB = Participation in Future Aerobic Exercise

Note: These abbreviations shall also obtain for the tables below.

Hypothesis Tests

A primary goal of this research was the development of a preliminary causal model for predicting and explaining participation in aerobic exercise. Cohen and Cohen (1983) indicated that the effects of an independent variable upon a dependent variable in a presumed causal model may be direct and/or indirect. Direct effects are not mediated by any intervening variables in the model, whereas indirect effects are so mediated. In the following analyses pertaining to the prediction of intention and aerobic exercise, the possibility of mediated relationships between the predictor variables was explored by altering their order of entry into hierarchical regression equations, and examining the effects of this procedure upon the relative amounts of unique incremental variance in the dependent variable accounted for by particular independent variables. A large drop in the unique variance accounted for by a variable that was initially entered first into an equation, and later entered last, suggests that its effects are at least partially mediated by the variables entered before it.

Prediction of Intention

Theory of Reasoned Action

Hypothesis one stated that a combination of attitude and subjective norm would significantly predict intention, controlling for prior behavior. As can be seen in Table 4.7

(which for convenience includes the analyses for the theory of planned behavior variables), hierarchical linear regression results supported this hypothesis, although of the theory of reasoned action variables only attitude made a significant unique contribution.

Table 4.7. Hierarchical linear regression results for the theories of reasoned action and planned behavior in predicting intention, controlling for prior behavior.

Variable	R	Total R^2	R^2 Change	F Change	Beta
PB	.68	.47	.47	247.57***	.40***
A	.84	.70	.23	215.09***	.53***
SN	.84	.70	.00	2.02	-.03
PBC	.84	.70	.00	.001	.01
AxSN	.84	.70	.00	.02	.02
AxPBC	.84	.70	.00	.74	.01
SNxPBC	.84	.70	.00	.63	.11
AxSNxPBC	.84	.70	.00	.07	-.04

***p<.001

Note: Only nonadjusted R^2 scores are reported for this linear regression analysis and those that follow. Also, in this table and those that follow, "Beta" refers to the standardized beta coefficient.

A second regression analysis in which prior behavior was entered first followed by a stepwise entry of attitude and subjective norm produced identical results, except that subjective norm did not enter into the equation. It thus appears that subjective norm did not add significant incremental variance in intention to engage in aerobic

exercise after controlling for prior behavior and attitude.

One might suggest that the effects of prior behavior on intention are actually mediated by theory of reasoned action variables. Table 4.8 displays hierarchical linear regression results testing this possibility. In this case the theory of reasoned action variables were entered before prior behavior (again, for convenience, perceived behavioral control and the interactions involving it have been included). The large drop in R^2 for prior behavior here, along with the fact that attitude accounts for a larger proportion of the intention variance than does prior behavior, suggests that such may be the case.

Table 4.8. Hierarchical linear regression results for the theories of reasoned action and planned behavior in predicting intention, prior behavior entered last.

Variable	R	Total R^2	R^2 Change	F Change	Beta
A	.76	.58	.58	386.87***	.53***
SN	.77	.59	.01	4.15*	-.03
PBC	.77	.59	.00	1.10	.01
AxSN	.77	.59	.00	.91	.02
AxPBC	.77	.59	.00	.75	.01
SNxPBC	.77	.59	.00	.04	.11
AxSNxPBC	.77	.59	.00	.01	-.04
PB	.84	.70	.11	104.68***	.40***

*p<.05, ***p<.001

Theory of Planned Behavior

Hypothesis two stated that perceived behavioral control would add significant incremental variance to the prediction of intention beyond that of prior behavior, attitude, and subjective norm. As can be seen from Table 4.7, this hypothesis was not supported. Similarly, the data of this table do not support hypothesis three, which suggested that perceived behavioral control would interact with attitude and subjective norm in predicting intention. Regression analyses in which prior behavior was entered first, followed by a stepwise procedure considering the remaining variables, yielded identical results, except that only attitude entered the equation beyond prior behavior. In addition, as Table 4.8 indicates, the effects of perceived behavioral control remained insignificant even when prior behavior was entered last into the equation.

Social Cognitive Theory

Hypothesis four stated that a combination of self-efficacy and outcome expectations would significantly predict intention, controlling for prior behavior. Hierarchical linear regression results supported this hypothesis, showing that the social cognitive theory variables added 13% to the variance in intention beyond prior behavior (see Table 4.9).

Table 4.10 displays the results of a second analysis which explored the possibility that the social cognitive

theory variables might mediate the effects of prior behavior on intention. The considerable drop in the R^2 for prior behavior when entered into the regression equation after the social cognitive theory variables suggests that these variables at least partially mediate the effects of prior behavior.

Table 4.9. Hierarchical linear regression results for social cognitive theory variables in predicting intention, controlling for prior behavior.

Variable	R	Total R^2	R^2 Change	F Change	Beta
PB	.68	.47	.47	247.57***	.45***
SE	.74	.55	.08	51.52***	.27***
OE	.77	.60	.05	31.45***	.24***

***p<.001

Table 4.10. Hierarchical linear regression results for social cognitive theory variables in predicting intention, prior behavior entered last.

Variable	R	Total R^2	R^2 Change	F Change	Beta
SE	.59	.34	.34	147.04***	.27***
OE	.67	.45	.11	56.32***	.24***
PB	.77	.60	.14	98.95***	.45***

***p<.001

Hypothesis five indicated that self-efficacy would exceed outcome expectations in predicting intention. To test this hypothesis, hierarchical linear regressions were conducted in which self-efficacy and outcome expectations were alternately entered first into the equation, followed by

prior behavior. Table 4.10 displays the results for the first of these analyses; Table 4.11 the results for the second. The results supported this hypothesis in that self-efficacy accounted for more variance after controlling for outcome expectations (16%) than did outcome expectations after controlling for self-efficacy (11%). A stepwise regression procedure considering only the social cognitive variables produced results identical to those of Table 4.10 for these variables (with the exception of the standardized beta coefficients).

Table 4.11. Hierarchical linear regression results for social cognitive theory variables in predicting intention--order of entry: outcome expectations, self-efficacy, prior behavior.

Variable	R	Total R^2	R^2 Change	F Change	Beta
OE	.54	.29	.29	116.70***	.24***
SE	.67	.45	.16	81.99***	.27***
PB	.77	.60	.14	98.95***	.45***

***p<.001

Perceived Social Support

Hypothesis six suggested that perceived social support would significantly predict intention above and beyond prior behavior. Hierarchical linear regression results, in which the order of entry of social support and prior behavior was varied, are presented in Tables 4.12 and 4.13. Although these results supported hypothesis six in a strict statistical sense, in practical terms they suggest that the

effects of social support in predicting intention are negligible beyond those of prior behavior. Moreover, social support did not appear to appreciably mediate the effects of past behavior on future behavior. A stepwise regression produced results identical to those of Table 4.12.

Table 4.12. Hierarchical linear regression results for social support and prior behavior in predicting intention--order of entry: prior behavior, social support.

Variable	R	Total R^2	R^2 Change	F Change	Beta
PB	.68	.47	.47	247.57***	.65***
SS	.69	.48	.01	4.96*	.10*

*p<.05, ***p<.001

Table 4.13. Hierarchical linear regression results for social support and prior behavior in predicting intention--order of entry: social support, prior behavior.

Variable	R	Total R^2	R^2 Change	F Change	Beta
SS	.33	.11	.11	34.71***	.10*
PB	.69	.48	.37	197.14***	.65***

*p<.05, ***p<.001

Prediction of Aerobic Exercise

Because the dependent variable, future participation in aerobic exercise, was measured dichotomously ("Yes" or "No"), logistic regression was used to test those hypotheses regarding the prediction of future behavior. In the tables that follow, the "deviance" statistic (also known as the "-2 log likelihood") measures the degree to which the estimated

logistic model fits the actual data. This statistic has a chi-square distribution with N-v degrees of freedom, where N is the sample size, and v is the number of parameters estimated. It is analogous to the residual sum of squares of linear regression (Hosmer & Lemeshow, 1989). A large p-value for the deviance statistic (generally, greater than .05) results in the retention of the null hypothesis that the observed likelihood of the model does not differ significantly from one (the value of the likelihood for a model that fits the data perfectly) (SPSS, 1990). The "improvement" statistic represents the change in deviance between successive steps in a logistic regression model, and is thus comparable to the F-change test of multiple linear regression (SPSS, 1990). It has a chi-square distribution with degrees of freedom equal to the difference between the deviance degrees of freedom for the two models being compared.

The "Wald" statistic also has a chi-square distribution, and provides the test that the coefficient for an independent variable is zero. It is thus comparable to the t-test for the regression coefficient of linear regression. The "R" statistic shows the partial correlation between the dependent variable and a particular independent variable when other independent variables are in the logistic regression equation. The significance levels for the improvement and Wald statistics are interpreted

conventionally, in this case at the .05 level.

Aldrich and Nelson (1984) pointed out that unlike linear regression (in which the outcome variable is measured on a continuous scale), logistic regression does not provide for an $\underline{R}^2$ summary statistic. However, they indicated that it is possible to obtain an estimate of the amount of variance accounted for by a given predictor variable by calculating a "pseudo $\underline{R}^2$" statistic, the formula for which is $\underline{c}/\underline{N}+\underline{c}$, where $\underline{c}$ is the sum of the improvement statistic for a particular model and those of the previous models, and $\underline{N}$ is the total sample size. This has been done for the hypotheses in this section. Finally, logistic regression permits a comparison of the outcomes predicted by a logistic regression model with those actually observed, and this has been done where appropriate.

Theory of Reasoned Action

Table 4.14 provides hierarchical logistic regression results for hypotheses seven, eight, and nine. Hypothesis seven suggested that intention would significantly predict aerobic exercise, controlling for prior behavior, and the results shown in Tables 4.14 and 4.15 support this hypothesis. The improvement statistic for intention shows that its addition significantly improves the model, and, moreover, its regression coefficient is significant.

Table 4.14. Hierarchical logistic regression results in predicting aerobic exercise.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
PB	251.05	282	.91	114.94	1	.001	.29	.29
PB, I	229.17	281	.99	21.88	1	.001	.33	.04
PB, I, PBC	229.16	280	.99	.01	1	.96	.33	.00
PB, I, PBC, IxPBC	229.14	279	.99	.02	1	.87	.33	.00

Note: Order of entry: prior behavior, intention, perceived behavioral control, and the interaction of intention and perceived behavioral control.

Table 4.15. Statistics for the final model of Table 4.14.

Variable	B	S.E.	Wald	df	p	R
PB	.74	.15	24.75	1	.001	.32
I	.17	.08	4.24	1	.04	.10
PBC	.002	.06	.002	1	.97	.00
IxPBC	-.002	.01	.03	1	.87	.00

Note: In this table and those that follow, "B" refers to the nonstandardized regression coefficient, and "S.E." refers to the standard error.

However, the increase in pseudo R^2 provided by intention is not great, and Table 4.16 shows that its addition provides only a small increase in overall prediction accuracy beyond that of prior behavior.

To examine the possibility that intention mediates the effects of prior behavior on participation in aerobic exercise, as suggested by the theory of reasoned action, an additional analysis was performed in which intention was entered before prior behavior (along with, for the hypotheses

Table 4.16. Percentages of correct classifications of exercisers (E) and nonexercisers (NE) for the models represented in Table 4.14.

Model	E Percentage	NE Percentage	Overall Percentage
PB	81%	79%	80%
PB, I	89%	68%	82%
PB, I, PBC	89%	68%	82%
PB, I, PBC, IxPBC	89%	68%	82%

that follow, perceived behavioral control and its interaction with intention). The results of this analysis are displayed in Tables 4.17 through 4.19.

Table 4.17. Hierarchical logistic regression results in predicting aerobic exercise, entering prior behavior last.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
I	257.60	282	.85	108.39	1	.001	.28	.28
I, PBC	257.39	281	.84	.21	1	.65	.28	.00
I, PBC, IxPBC	257.34	280	.83	.05	1	.82	.28	.00
I, PBC, IxPBC, PB	229.14	279	.99	28.20	1	.001	.33	.05

Table 4.17 shows that intention produced a pseudo R^2 value that was nearly equal to that of prior behavior when the latter variable was entered into the equation first, and that the pseudo R^2 value for prior behavior dropped

considerably when intention was entered into the logistic

Table 4.18. Statistics for the final model of Table 4.17.

Variable	B	S.E.	Wald	df	p	R
I	.17	.08	4.23	1	.04	.09
PBC	.003	.06	.002	1	.97	.00
IxPBC	-.002	.01	.03	1	.87	.00
PB	.74	.15	24.80	1	.001	.30

Table 4.19. Percentages of correct classifications of exercisers and nonexercisers for the models represented in Table 4.17.

Model	E Percentage	NE Percentage	Overall Percentage
I	90%	61%	80%
I, PBC	90%	61%	80%
I, PBC, IxPBC	90%	61%	80%
I, PBC, IxPBC, PB	89%	68%	82%

regression equation before it. Moreover, comparison of Tables 4.16 and 4.19 shows that intention provided greater accuracy in predicting those who ultimately engaged in aerobic exercise than did prior behavior (90% versus 81%), although it did not do as well as prior behavior in predicting those who did not exercise (61% versus 79%). The overall prediction accuracies for intention and prior behavior were identical at 80%. These results suggest that intention did largely mediate the effects of prior aerobic behavior on future aerobic participation.

Theory of Planned Behavior

Hypothesis eight stated that perceived behavioral control would significantly predict aerobic exercise after controlling for prior behavior and intention. Hypothesis nine made the same prediction for the interaction of perceived behavioral control and intention. Tables 4.14 through 4.19 show that these hypotheses were not supported.

Social Cognitive Theory

Tables 4.20 and 4.21 display the hierarchical logistic regression results for hypothesis ten, which maintained that self-efficacy and outcome expectations would significantly predict aerobic exercise after controlling for prior behavior. As can be seen, the addition of self-efficacy and outcome expectations did not significantly improve the model containing prior behavior, and their regression coefficients and partial correlations with future aerobic exercise were not significant when prior behavior was included in the model. Therefore, this hypothesis was not supported.

It is possible that the social cognitive variables mediate the effects of prior behavior on future behavior, and Tables 4.22 and 4.23 provide the results of a test of this possibility. In this case, although the social cognitive variables provided an improvement over the constant-only model, their overall fit for the data was only marginal (the significance level for the deviance for the model containing

Table 4.20. Hierarchical logistic regression results in predicting aerobic exercise from self-efficacy and outcome expectations, controlling for prior behavior.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
PB	251.05	282	.91	114.94	1	.001	.29	.29
PB, SE	248.71	281	.92	2.34	1	.13	.29	.00
PB, SE, OE	248.03	280	.92	.68	1	.41	.29	.00

Table 4.21. Statistics for the final model of Table 4.20.

Variable	B	S.E.	Wald	df	p	R
PB	1.02	.14	51.11	1	.001	.44
SE	.02	.02	1.80	1	.19	.00
OE	.01	.01	.68	1	.41	.00

both self-efficacy and outcome expectations was only .06). Furthermore, their regression and partial correlation coefficients were not significant when prior behavior was in the model.

Table 4.22. Hierarchical logistic regression results in predicting aerobic exercise--order of entry: self-efficacy, outcome expectations, and prior behavior.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
SE	330.04	282	.03	35.95	1	.001	.11	.11
SE, OE	319.94	281	.06	10.10	1	.001	.14	.03
SE, OE, PB	248.03	280	.92	71.91	1	.001	.29	.15

Table 4.23. Statistics for the final model of Table 4.22.

Variable	B	S.E.	Wald	df	p	R
SE	.02	.02	1.80	1	.19	.00
OE	.01	.01	.68	1	.41	.00
PB	1.02	.14	51.11	1	.001	.39

Table 4.24. Percentages of correct classifications of exercisers and nonexercisers for the models represented in Table 4.22.

Model	E Percentage	NE Percentage	Overall Percentage
SE	89%	30%	69%
SE, OE	88%	35%	70%
SE, OE, PB	83%	74%	80%

Hypothesis 11 stated that self-efficacy would exceed outcome expectations in predicting aerobic exercise. To test this hypothesis, two hierarchical logistic regressions were performed in which self-efficacy and outcome expectations were alternately entered first. Table 4.22 displays the first of these analyses; Table 4.25 the second. Overall, results minimally supported this hypothesis. For example, the pseudo $\underline{R}^2$ is slightly larger for self-efficacy than is that for outcome expectations (.11 versus .09, respectively). However, the small significance levels for the deviances for both self-efficacy and outcome expectations when entered first (.03 and .01, respectively) suggest that the models for these variables do not fit the data well. Moreover, when prior behavior was included in the equations, the regression coefficients for both self-efficacy and outcome expectations

became nonsignificant, and their partial correlations with future aerobic exercise dropped to zero. Further, although the prediction accuracy for the model including both self-efficacy and outcome expectations was good for exercisers, it correctly classified only 35% of nonexercisers (see Tables 4.24 and 4.27). These results suggest that self-efficacy and outcome expectations were of limited utility as direct predictors of aerobic exercise.

Table 4.25. Hierarchical logistic regression results in predicting aerobic exercise from self-efficacy and outcome expectations--order of entry: outcome expectations, self-efficacy, and prior behavior.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
OE	339.46	282	.01	26.53	1	.001	.09	.09
OE, SE	319.94	281	.06	19.52	1	.001	.14	.05
OE, SE, PB	248.03	280	.92	71.91	1	.001	.29	.15

Table 4.26. Statistics for the final model of Table 4.25.

Variable	B	S.E.	Wald	df	p	R
OE	.01	.01	.68	1	.41	.00
SE	.02	.02	1.80	1	.19	.00
PB	1.02	.14	51.11	1	.001	.39

Table 4.27. Percentages of correct classifications of exercisers and nonexercisers for the models represented in Table 4.25.

Model	E Percentage	NE Percentage	Overall Percentage
OE	88%	29%	68%
OE, SE	88%	35%	70%
OE, SE, PB	83%	74%	80%

Perceived Social Support

According to hypothesis 12, perceived social support would significantly predict aerobic exercise when controlling for prior behavior. Logistic regression results (Tables 4.28 and 4.29) did not support this hypothesis. A second analysis

Table 4.28. Hierarchical logistic regression results in predicting aerobic exercise from perceived social support, controlling for prior behavior.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
PB	251.05	282	.91	114.94	1	.001	.29	.29
PB, SS	251.05	281	.90	.008	1	.93	.29	.00

Table 4.29. Statistics for the final model of Table 4.28.

Variable	B	S.E.	Wald	df	p	R
PB	1.11	.14	63.05	1	.001	.49
SS	.002	.02	.01	1	.93	.00

which entered perceived social support before prior behavior is shown in Table 4.30. This model did not fit the data well, and the regression and partial correlation coefficients

Table 4.30. Hierarchical logistic regression results in predicting aerobic exercise from perceived social support and prior behavior--order of entry: perceived social support, prior behavior.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
SS	350.93	282	.003	15.06	1	.001	.05	.05
SS, PB	251.05	281	.90	99.88	1	.001	.29	.24

Table 4.31. Statistics for the final model of Table 4.30.

Variable	B	S.E.	Wald	df	p	R
SS	.00	.02	.01	1	.93	.00
PB	1.11	.14	63.05	1	.001	.42

Table 4.32. Percentages of correct classifications of exercisers and nonexercisers for the models represented in Table 4.30.

Model	E Percentage	NE Percentage	Overall Percentage
SS	92%	17%	66%
SS, PB	81%	79%	80%

for social support were not significant when prior behavior was included in the equation. In terms of prediction accuracy, social support considered alone correctly classified 92% of the exercisers, but only 17% of the nonexercisers (Table 4.32). Thus, perceived social support was not useful overall in predicting aerobic exercise.

Theory Comparisons

According to hypothesis 13, the theoretical constructs and perceived social support would differ in terms of their predictive variance regarding intention. This was tested by comparing the total R^2 accounted for by the regression models of hypotheses one through six (see Table 4.33). The model

Table 4.33. Comparison of the R^2s for the regression models of hypotheses one through six.

Hypothesis	Total R^2
One: Prior behavior and the theory of reasoned action variables	.70
Two: Prior behavior and the theory of planned behavior variables	.70
Three: Prior behavior, the theory of planned behavior variables, and the pertinent interactions	.70
Four: Prior behavior and the social cognitive variables	.60
Five: The social cognitive variables considered alone	.45
Six: Prior behavior and perceived social support	.48

representing hypothesis one (which suggested that a combination of attitude and subjective norm would significantly predict intention after controlling for prior behavior) accounted for the most variation in intention (.70). In the analysis for this hypothesis, it will be

recalled, only attitude accounted for significant additional variance (23%) beyond prior behavior.

Hypothesis 14 stated that the theoretical constructs and perceived social support would complement one another in explaining intention, yielding a higher R^2 than any of the theoretical models considered alone. To test this hypothesis, a regression analysis was conducted in which prior behavior was entered first, followed by a stepwise entry of the remaining variables. Table 4.34 displays its results. The total amount of intention variance accounted for here is .71, which only minimally exceeds the .70 of Table 4.33. Therefore Hypothesis 14 is not supported.

Table 4.34. Stepwise multiple linear regression results for all of the theoretical constructs, controlling for prior behavior.

Variable	R	Total R^2	R^2 Change	F Change	Beta
PB	.68	.47	.47	247.57***	.40***
A	.84	.70	.23	215.09***	.50***
SE	.84	.71	.01	14.03***	.15***

***p<.001

A second regression analysis was conducted to explore the possibility that attitude and self-efficacy might mediate the effects of prior behavior on intention. The results of this analysis, displayed in Table 4.35, suggest that these variables do, in fact, serve a mediating function.

Table 4.35. Hierarchical linear regression results entering attitude and self-efficacy before prior behavior in predicting intention.

Variable	R	Total R^2	R^2 Change	F Change	Beta
A	.76	.58	.58	386.87***	.50***
SE	.79	.63	.05	36.58***	.15***
PB	.84	.71	.09	83.64***	.36***

***$p<.001$

According to hypothesis 15, the theoretical constructs and perceived social support would differ in terms of their predictive variance regarding aerobic exercise. This was tested by comparing the pseudo R^2s for the logistic regression models represented in hypotheses seven through 12, as shown in Table 4.36. The results only weakly supported this hypothesis. As can be seen, the model for hypothesis seven, which contained prior behavior and intention as independent variables, was most parsimonious and somewhat more efficient than the other models in accounting for variance in future aerobic exercise (pseudo R^2=.33).

Table 4.36. Comparison of the pseudo R^2s of hypotheses seven through 12.

Hypothesis	Total Pseudo R^2
Seven: Prior behavior and the theory of reasoned action variable of intention	.33
Eight: Prior behavior and the theory of planned behavior variables of intention and perceived behavioral control	.33
Nine: Prior behavior and the theory of planned behavior variables of intention, perceived behavioral control, and the interaction of intention and perceived behavioral control	.33
Ten: Prior behavior and the social cognitive theory variables	.29
Eleven: The social cognitive theory variables considered alone	.14
Twelve: Prior behavior and perceived social support	.29

Hypothesis 16 stated that the theoretical constructs and perceived social support would complement one another in explaining aerobic exercise, yielding a higher pseudo R^2 than any of the individual theoretical models considered alone. This hypothesis was tested by conducting a logistic regression analysis in which prior behavior was entered first, followed by a stepwise entry of the other variables.

The model that resulted from this procedure, displayed in Table 4.37, produced a pseudo R^2 value of .33, which does not exceed the highest pseudo R^2 value shown in Table 4.36 (also .33). Thus, hypothesis 16 was not supported.

Table 4.37. Stepwise logistic regression results for all of the theoretical constructs in predicting aerobic exercise, controlling for prior behavior.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
PB	251.05	282	.91	114.94	1	.001	.29	.29
PB, I	229.17	281	.99	21.88	1	.001	.33	.04

Table 4.38. Statistics for the final model of Table 4.37.

Variable	B	S.E.	Wald	df	p	R
PB	.74	.15	25.02	1	.001	.30
I	.16	.04	20.31	1	.001	.27

A second logistic regression analysis tested the possibility that the theoretical variables might mediate the effects of prior behavior on aerobic exercise. In this case, all of the theoretical predictor variables were entered as a set, followed by prior behavior. Table 4.39 suggests that the variables in fact mediate the effects of prior aerobic participation on future aerobic exercise behavior; Table 4.40 shows that, of these, only the regression coefficient for intention remained significant in light of prior behavior.

Table 4.39. Logistic regression results in predicting aerobic exercise--order of entry: all of the theoretical variables, prior behavior.

Model	Deviance	df	p	Improvement	df	p	Total Pseudo R^2	Pseudo R^2 Change
Constant	365.99	283	---	---	1	---	---	---
Variables	247.66	271	.84	118.33	12	.001	.29	.29
Variables, PB	216.97	270	.99	30.69	1	.001	.34	.05

Table 4.40. Statistics for the final model of Table 4.39.

Variable	B	S.E.	Wald	df	p	R
I	.32	.15	4.92	1	.03	.11
A	-.30	.23	1.67	1	.20	.00
SN	.26	.17	2.35	1	.13	.04
PBC	-.21	.16	1.82	1	.18	.00
AxSN	-.004	.03	.02	1	.89	.00
AxPBC	.05	.03	2.95	1	.09	.06
AxSNxPBC	-.0001	.004	.002	1	.97	.00
SNxPBC	-.02	.02	.81	1	.37	.00
IxPBC	-.02	.02	1.69	1	.19	.00
SE	-.01	.02	.47	1	.49	.00
OE	-.01	.01	1.38	1	.24	.00
SS	-.04	.03	2.10	1	.15	-.02
PB	.84	.17	25.99	1	.001	.31

Supplementary Predictive Analyses

In the above predictive equations the effects of prior behavior were controlled statistically by entering prior behavior first into the regression equations. However, this strategy may obscure the possibility that the theories are differentially useful for persons who have previously engaged regularly in aerobic exercise and those who have not. Therefore, in supplementary analyses, prior behavior was

controlled methodologically by dividing the sample into two groups: those subjects who indicated that they had engaged in aerobic exercise in at least 3 of the 4 weeks prior to participating in this research ("regular exercisers"); and those who indicated that they had done so in 2 weeks or fewer ("irregular exercisers"). Analyses were then conducted with each of these subsamples for the prediction of intention and aerobic exercise by sequentially rotating the entry order of the sets of variables for the theory of planned behavior, social cognitive theory, and perceived social support (for convenience, and because the theory of reasoned action is subsumed in the theory of planned behavior, only the results for the latter theory are reported here). Tables 4.41 and 4.42 present summary statistic results for these analyses in predicting intention. As can be seen, the overall trends are consistent with the previous analyses, though the theoretical models generally accounted for more intention variation among regular exercisers than irregular exercisers. Given the previous results, this may reflect the apparently more positive attitudes and stronger self-efficacy beliefs of the regular exercisers.

Table 4.41. Hierarchical linear regression results of sequentially entering the variables as sets to predict intention among regular exercisers.

Predictor	R^2	Predictor	R^2	Predictor	R^2
TPB	= .74	SS	= .00	SC	= .39
SC	= .05	TPB	= .74	SS	= .00
SS	= .00	SC	= .05	TPB	= .40
Total	= .79	Total	= .79	Total	= .79

Note: n=121
TPB = Theory of planned behavior variables
SC = Social cognitive theory variables
SS = Social support
These abbreviations also apply to Tables 4.42 through 4.44.

Table 4.42. Hierarchical linear regression results of sequentially entering the variables as sets to predict intention among irregular exercisers.

Predictor	R^2	Predictor	R^2	Predictor	R^2
TPB	= .47	SS	= .11	SC	= .32
SC	= .03	TPB	= .37	SS	= .04
SS	= .01	SC	= .03	TPB	= .15
Total	= .51	Total	= .51	Total	= .51

Note: n=163

Tables 4.43 and 4.44 present summary statistic results for these analyses in predicting aerobic exercise. As with the prediction of intention, the basic trends for the theoretical variables remained similar to those of the previous analyses, although the total amount of pseudo variance accounted for by them dropped considerably for the regular exercisers. This finding suggests that the theoretical variables may be particularly useful in predicting aerobic exercise only among persons not already regularly engaged in it.

Table 4.43. Hierarchical logistic regression results of sequentially entering the variables as sets to predict aerobic exercise among regular exercisers.

Predictor	Pseudo R^2	Predictor	Pseudo R^2	Predictor	Pseudo R^2
TPB	= .06	SS	= .00	SC	= .04
SC	= .02	TPB	= .07	SS	= .00
SS	= .00	SC	= .01	TPB	= .04
Total	= .08	Total	= .08	Total	= .08

Note: n=121.

Table 4.44. Hierarchical logistic regression results of sequentially entering the variables as sets to predict aerobic exercise among irregular exercisers.

Predictor	Pseudo R^2	Predictor	Pseudo R^2	Predictor	Pseudo R^2
TPB	= .24	SS	= .02	SC	= .04
SC	= .01	TPB	= .22	SS	= .01
SS	= .00	SC	= .01	TPB	= .20
Total	= .25	Total	= .25	Total	= .25

Note: n=163

Summary

The above research analyses indicate that, of the theoretical variables, only attitude and self-efficacy were important in predicting intention. Furthermore, the effects of these two variables went beyond those of prior aerobic exercise behavior. Only intention emerged as important in predicting actual aerobic exercise behavior, and its effects also exceeded those of prior behavior. Subjective norm, perceived behavioral control, outcome expectations, and

perceived social support played little or no unique role in predicting either intentions to engage in aerobic exercise or actual aerobic exercise behavior. Figure 4.1 displays a model which most parsimoniously summarizes the findings of this research. It shows that attitude and self-efficacy mediate the relationship between prior aerobic exercise and intention, which in turn mediates the relationship between these variables and future aerobic exercise.

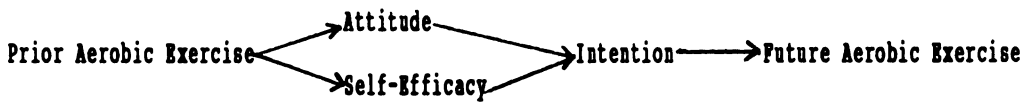

Figure 4.1. Summary research model.

CHAPTER 5

Discussion

This chapter reviews the fundamental purpose of this study, summarizes the research findings, and integrates these findings with those of previous research. In addition, it discusses implications for practice and future research, and addresses the limitations of this study.

Purpose of the Study

The object of this study was to predict participation in aerobic exercise in a sample of college students. In this effort three theories of behavior were examined: the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen, 1985; Ajzen & Madden, 1986; Schifter & Ajzen, 1985), and social cognitive theory (Bandura, 1986). In addition, the predictive utility of these theories was compared with that of perceived social support and prior involvement in aerobic exercise.

Summary and Integration of Research Results

The theory of reasoned action suggests that the immediate determinant of a behavior is an intention to engage in that behavior. The present results supported the predictive utility of intention, and are generally consistent with the findings of previous applications of the theory of reasoned action. For example, the zero-order correlation of .60 between intention and aerobic exercise is comparable to prior results for various behaviors (e.g., Ajzen & Madden, 1986; Bagozzi, 1981; Bowman & Fishbein, 1978; Davidson & Jaccard, 1975; DeVries & Ajzen, 1971; Fishbein et al., 1980; Godin et al., 1987; Jaccard & Davidson; Manstead et al., 1983; Pomazal & Jaccard, 1976; Riddle, 1980; Smetana & Adler, 1979; Valois et al., 1988; Vinokur-Kaplan, 1978). In addition, the effects of intention went beyond those of prior aerobic exercise, and intention yielded an overall prediction accuracy for aerobic exercise that was equal to that of prior behavior. Most importantly, in a theoretical sense, results were consistent with a model in which intention mediates the effects of prior exercise on future aerobic exercise.

In contrast to the results of this study and those of other applications of reasoned action theory to aerobic exercise, Dzewaltowski (1989) and Dzewaltowski et al. (1989) found that though the relationships posited by the theory

obtained, intention accounted for only 5% and 10%, respectively, of physical activity variance. In both cases, lack of correspondence between the intention and behavior measures probably accounted for the small amount of variation in behavior accounted for by intention.

The theory of reasoned action also holds that a combination of attitude and subjective norm will predict intention. The present findings indicated that, of the two variables, only attitude added significant incremental variance over prior behavior ($\underline{R}^2$ change = .23) in predicting intention. This finding is consistent with previous applications of the theory of reasoned action to aerobic activity (Dzewaltowski, 1989; Dzewaltowski et al., 1989; Godin and Shephard, 1985; Godin et al., 1987; Riddle, 1980; Valois et al., 1988).

The theory of planned behavior suggests that perceived behavioral control will play an important role in the prediction of both intention and actual behavior if the behavior in question is not under volitional control. In this study perceived behavioral control did not significantly predict either intention or behavior, perhaps suggesting that subjects perceived aerobic exercise as a volitional behavior. These findings contrast with those of Dzewaltowski et al. (1989), who found that perceived behavioral control improved the prediction of intention, though not of actual physical activity. However, the present study assessed perceived

behavioral control over the course of 1 week, whereas Dzewaltowski et al. (1989) assessed this variable over the course of 4 weeks. It should also be noted that, overall, the subjects in the present study indicated a relatively high degree of perceived control over aerobic exercise, resulting in a negative skew and restriction of range problem for this measure (see Table 4.4). This, along with the measure's marginal reliability, suggests that the findings for perceived behavioral control should be viewed somewhat cautiously.

Intuitively, it would seem that the theoretical constructs of perceived behavioral control and self-efficacy should be closely related, as suggested by Ajzen (1985) and Ajzen and Madden (1986). However, Dzewaltowski et al. (1989) and the present study found that perceived behavioral control and self-efficacy correlate only modestly (r's of .37 and .23, respectively). These findings may be an artifact of measurement: both studies assessed self-efficacy as a situation-bound construct, whereas perceived behavioral control was assessed in more general terms. It is possible that when subjects consider behavioral control globally they do not take into account their ability to negotiate specific contextual barriers. Of course, the restricted range and marginal reliability of the behavioral control measure in this study may also have attenuated its correlation with self-efficacy.

This study provides partial support for social cognitive theory in that the combination of self-efficacy and outcome expectations offered significant incremental variance in predicting intention, though not actual exercise. These results are similar to those of Wurtele and Maddux (1987), who found that self-efficacy accounted for 18% of the variance in intention to engage in aerobic exercise, and that intention mediated the self-efficacy-behavior relationship. By contrast, Dzewaltowski (1989), and Dzewaltowski et at. (1989), found that self-efficacy had direct effects on physical activity and exceeded intention in predicting this behavior. In addition, in keeping with Bandura's (1986) theory, self-efficacy exceeded outcome expectations somewhat in predicting intention. These results are consistent with previous research comparing self-efficacy and outcome expectations in predicting behavior (Barling & Beattie, 1983; Desharnais et al., 1986; Dzewaltowski, 1989; Dzewaltowski et al., 1989; Godding & Glasgow, 1985; Lee, 1984; Manning & Wright, 1983).

Previous research results suggested that social support may be an important factor in promoting aerobic exercise (Andrew & Parker, 1979; Heinzelmann & Bagley, 1970; Holm et al., 1985; King & Frederiksen, 1984; King et al., 1988; Wankel, 1985; Wankel et al., 1985). The present study found that perceived social support did relate to intentions and actual exercise behavior, but that it did not offer much

incremental variance over past behavior, and generally did not perform as well as the other theoretical models. However, unlike the present research, most of the above-mentioned studies involved structured exercise programs, and it is possible that perceived social support might be a more important consideration in those circumstances. It seems likely that persons involved in self-initiated and self-maintained programs of aerobic exercise are more self-reliant in terms of adherence than are those who are involved in structured or prescribed aerobic exercise programs.

It is of interest to note that perceived social support and subjective norm did not correlate as highly as one might expect given that they both involve aspects of one's social environment (r=.46). However, subjective norm, reflecting the social pressures one perceives regarding engaging in a behavior, may involve an element of perceived coercion, whereas social support, as assessed here, reflects receipt of positive social resources for exercise. In any case, the present research results for these concepts suggest that one's social environment may have less to do with participation in self-initiated and self-maintained programs of aerobic exercise then do other cognitive and behavioral constructs.

Not surprisingly, prior behavior emerged as an important predictor of future aerobic exercise. Its correlation with future behavior was comparable to that of

intention, and prior behavior and intention achieved similar overall accuracy in classifying exercisers and non-exercisers (80%). Overall, prior behavior was more useful in predicting who would not engage in aerobic exercise (79% versus 61%), whereas intention was superior in predicting who would exercise (90% versus 81%).

However, as useful as prior behavior may be in predicting participation in aerobic exercise, it--by itself--is of limited theoretical and clinical utility. That is, theory is necessary both to explain the mechanisms through which past behavior operates, and to guide treatment applications. The present results, along with those of other researchers, suggest that certain theory of reasoned action and social cognitive theory variables provide a theoretical link between past behavior and future behavior.

Clinical Implications

A few clinical implications of these findings may be cited, though these are offered tentatively pending replication and extension of these findings using designs that support causal inferences. Because these and other research results largely substantiate the relationship of intention to future behavior, as posited by the theory of reasoned action, it would be useful to incorporate this model into health education as a tool for increasing the incidence

of self-initiated and self-maintained programs of aerobic exercise among college students. Because the attitudinal component of this model is most predictive of intentions, specific attention should be devoted to its determinants--namely, the target population's salient beliefs about the outcomes of aerobic exercise and its evaluations of these outcomes. These determinants could be identified in the manner prescribed by Ajzen and Fishbein (1980), and specific strategies developed for modifying attitudes, with a view to increasing intention and, hence, aerobic exercise.

In developing such strategies, it should be borne in mind that

> attempts to bring about change invariably involve exposure to new information about some object, behavior, issue, or event. Changes in beliefs resulting from such exposure to new information provide the foundation on which rests the ultimate effectiveness of any influence attempt (Fishbein & Ajzen, 1975, p. 387).

Fishbein and Ajzen (1975) stated that there are two basic strategies for bringing about change: active participation, in which "a person can be placed in a situation where he can personally observe that an object has a given attribute;" and persuasive communication, in which "the person may be told by an outside source that the object has the attribute in question" (p. 388). Attempts to modify aerobic exercise behavior may thus incorporate these two strategies.

Self-efficacy expectations may also help mediate the past behavior-intention relationship, and thus deserve clinical attention. Bandura's (1986) suggestions for modifying efficacy beliefs subsume Fishbein and Ajzen's (1975) change strategies. According to Bandura (1986), self-efficacy beliefs derive from four basic sources:

> performance attainments; vicarious experiences of observing the performances of others; verbal persuasion and allied types of social influences that one possesses certain capabilities; and physiological states from which people partly judge their capableness, strength, and vulnerability to dysfunction (p.399).

It follows that attempts to modify self-efficacy beliefs should focus on these sources. Of these, vicarious experience and verbal persuasion may be the most practical for initially influencing the self-efficacy beliefs of sedentary persons, though it is possible that even small aerobic performance attainments may enhance self-efficacy.

Implications for Future Research

Future research efforts should replicate and extend the findings of this research by applying the theoretical models to other populations in different settings (e.g. industry). The U.S. adult population in general merits attention, given its disturbingly low incidence of aerobic exercise. Application of the theoretical models to persons involved in formally structured programs of aerobic exercise also seems

useful. In this regard, the differential importance of social support for participation in structured versus unstructured programs of aerobic exercise warrants further scrutiny.

Experimental studies would also be valuable to confirm potential causal impact of the theoretical variables upon aerobic exercise. Given that Bandura (1986) and Fishbein and Ajzen (1975) postulate that beliefs ultimately determine behavior, experimental manipulations of key exercise beliefs seem important in determining effective means of modifying sedentary lifestyles. Both theories suggest relevant treatment components, as noted above. It may also be useful to identify specific misperceptions and erroneous beliefs regarding participation in aerobic exercise, as well as perceived barriers to exercise.

Further psychometric refinement of the measures used here also seems appropriate, particulary given that perceived behavioral control and a few other measures achieved only marginal levels of reliability. Despite the limited utility of the perceived behavioral control measure in this study, Dzewaltowski et al.'s (1989) findings suggest that this construct deserves further study. It may prove useful when applied to samples for whom exercise is constrained by environmental factors, e.g., single parents with many time demands. In addition, continued delineation of the relationship between perceived behavioral control and self-

efficacy would appear to be useful.

This study found preliminary indications that the theoretical variables examined may not be particularly useful in predicting the exercise behavior of persons already engaged in regular aerobic exercise. Although more research is necessary to substantiate this finding, it is possible that other theoretical constructs may be necessary to more fully account for aerobic exercise. For example, according to Triandis (1977), as a behavior becomes increasingly habitual it depends less upon cognitively mediated processes, such as intention, and more upon the habit itself. It may be that for regular aerobic exercisers the behavior is so well-entrenched in their weekly schedules, or "overlearned," that they more or less reflexively, or habitually, intend to exercise weekly without giving real regard to potential barriers to doing so. This conceptualization seems in keeping with classical learning theory.

Finally, factor analysis may be useful to explore the possibility of common dimensions underlying the theoretical variables of intention, attitude, subjective norm, perceived behavioral control, self-efficacy, outcome expectations, and perceived social support. Preliminary results conducted as a supplementary part of this study (see Appendix D) suggested that two factors may underlie these variables: one reflecting a general perceived competence in, or proclivity toward, aerobic exercise; the other a possible reliance on

others (as opposed to self) for exercise motivation.

Limitations to this Research

Several factors may have influenced the results of this research to an unknown degree. For example, data were collected by means of self-report, and thus may have been subject to response distortion. Subjects' misunderstanding of items or parts of the assessment instrument also may have gone undetected, contributing to invalid responses. In addition, participation in aerobic exercise was not confirmed objectively (e.g., by assessing VO^2 max), and the extent to which reported exercise was actually aerobically beneficial is unknown. It is also possible that some subjects were, in fact, involved in formally structured aerobic exercise programs. Further, generalization of the results of this research must be limited to healthy college students--perhaps one of the most physically active segments of the American population.

It also must be noted that this study was correlational in design, such that causal relationships among the variables, though implied, are by no means confirmed. The study utilized a number of novel measures whose psychometric properties were not well-established (e.g., perceived behavioral control), thereby limiting the interpretation of results. Finally, the present study is limited by its

treatment of future exercise as a dichotomous variable--some information is inevitably sacrificed when variables are dichotomized. This measurement decision necessitated the use of logistic regression, a relatively new data analytic technique, as well as the calculation of pseudo $\underline{R}^2$ values, a summary statistic that is somewhat controversial (Aldrich & Nelson, 1984).

APPENDICES

APPENDIX A

Definition of Terms

Aerobic exercise: Exercise that "requires the use of large muscles and consists of moving the body weight against gravity or over a distance using rhythmic or dynamic movements" (Haskell, 1984, p. 413).

Aerobic exerciser: one who engages in aerobic exercise at least 3 days per week for a minimum of 20 minutes (American College of Sports Medicine, 1978).

Non-aerobic exerciser: one who does not meet the criteria of an aerobic exerciser.

Behavioral intention: one's subjective probability of engaging in a given behavior (Ajzen & Fishbein, 1980).

Attitude: one's positive or negative evaluation of performing a given behavior (Ajzen & Fishbein, 1980).

Subjective norm: one's perception of the social pressures placed upon one to perform or not to perform a behavior (Ajzen & Fishbein, 1980).

Perceived behavioral control: one's perception of the ease or difficulty involved with performing a behavior (Ajzen & Madden, 1986).

Self-efficacy beliefs: one's judgment of one's capability to organize and execute courses of action required to attain designated types of performances (Bandura, 1986).

Outcome expectancy: one's judgment of the likely consequences of a given behavior (Bandura, 1986). (For this study, outcome expectancy was measured using an expectancy-value format. For a discussion of the rationale for this, please see the "Outcome Expectations" section of Chapter 3.)

Perceived social support: "the caring, encouragement, assistance, and positive attitudes toward exercise of significant others" (Clearing-Sky, 1986, p. 13).

APPENDIX B

Research Consent Form

This research is intended to explore the relationship between people's views of aerobic exercise and their participation in it. The results may provide a better understanding of why people do or do not engage in aerobic exercise. Participation in the study will involve filling out the attached questionnaire now and in one week. If you wish to participate in this study, please read the following points, and sign and print your name where indicated. You indicate your voluntary agreement to participate by completing and returning this consent form.

1. I have freely consented to take part in this study, which is being conducted by Galen A. Yordy, doctoral student in Counseling Psychology at Michigan State University, under the supervision of Dr. Robert W. Lent. I understand that I may contact Mr. Yordy at any time if I have questions about my participation in this research.

2. The study has been explained to me, and I understand the explanation that has been given and what my participation will involve. My participation in this research is completely voluntary.

3. I understand that participation will pose no risks or discomfort to me, and that I am free to discontinue my participation in the study at any time without penalty.

4. I understand that the results of the study will be treated in strict confidence, and that I will not be identified by name in any reporting of the results of this research. Within these restrictions, results of the study will be made available to me at my request.

Signed: _____ Please print name: _____

Date: _____

APPENDIX C

The Final Questionnaire

This questionnaire is concerned with your views of aerobic exercise. For this study, "aerobic exercise" is defined as

> any exercise that uses large muscle groups, is maintained continuously for at least 20 minutes, and occurs at least 3 days per week.

Examples include jogging, swimming, aerobic walking, cross-country skiing, bicycling, and aerobic dance. You can also obtain an aerobic workout by using the various aerobic machines found in the intramural buildings. Activities such as weight lifting and stretching are not aerobic exercises. Also, please do not consider merely walking or cycling around campus or to classes as aerobic exercise. We are specifically concerned with your views about engaging in aerobic exercise in the coming week (in the seven-day period starting with today).

The first 38 questions make use of rating scales with seven places. You are to make a check mark in the place that best describes your opinion. For example, if you were asked to rate "The weather in Michigan" on such a scale, you might respond as follows:

The weather in Michigan is:

GOOD_____:__X__:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

This response indicates that in your opinion the weather in Michigan is "quite good."

If you were asked to rate the likelihood of your winning one million dollars in the next state lottery on such a scale, you might respond as follows:

My winning one million dollars in the next state lottery is:

LIKELY_____:_____:_____:_____:_____:_____:__X__UNLIKELY
extremely quite slightly neither slightly quite extremely

This response indicates that in your opinion your winning one million dollars in the next state lottery is "extremely unlikely."

In marking your ratings, please remember the following points:

1. Place your marks in the middle of the spaces, and not on the boundaries:

__X__:_____:_____:_____:_____:_____:X_____
This Not this

2. Never place more than one mark on a single scale.

3. Be sure to answer all of the items.

1. I intend to engage in aerobic exercise in the coming week:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

2. For me to engage in aerobic exercise in the coming week is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

3. Most people who are important to me think I should engage in aerobic exercise in the coming week:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

GO ON TO THE NEXT PAGE

4. How much control do you have over whether you do or do not engage in aerobic exercise in the coming week?

COMPLETE CONTROL_____:_____:_____:_____:_____:_____:_____VERY LITTLE CONTROL
extremely quite slightly neither slightly quite extremely

5. Generally speaking, things that cost me money are:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

6. Generally speaking, relieving tension for me is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

7. Generally speaking, reaching my ideal weight is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

8. Generally speaking, my being physically injured is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

9. Generally speaking, my feeling better is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

10. Generally speaking, improving my mental alertness is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

11. Generally speaking, my being bored is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

GO ON TO THE NEXT PAGE

12. Generally speaking, improving my muscle tone is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

13. Generally speaking, my meeting people is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

14. Generally speaking, for me, time-consuming activities are:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

15. Generally speaking, my being physically fit is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

16. Generally speaking, improving my physical appearance is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

17. Generally speaking, my being healthy is:

GOOD_____:_____:_____:_____:_____:_____:_____BAD
extremely quite slightly neither slightly quite extremely

18. For me to engage in aerobic exercise in the coming week is:

BENEFICIAL_____:_____:_____:_____:_____:_____:_____HARMFUL
extremely quite slightly neither slightly quite extremely

19. The people whose opinions I value most believe I should engage in aerobic exercise in the coming week:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

GO ON TO THE NEXT PAGE

20. It is mostly up to me whether I engage in aerobic exercise in the coming week:

AGREE_____:_____:_____:_____:_____:_____:_____DISAGREE
extremely quite slightly neither slightly quite extremely

21. I will engage in aerobic exercise in the coming week:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

22. Engaging in aerobic exercise in the coming week would cost me money:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

23. Engaging in aerobic exercise in the coming week would relieve tension for me

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

24. Engaging in aerobic exercise in the coming week would help me to reach my ideal weight.

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

25. Engaging in aerobic exercise in the coming week would be physically injurious to me:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

26. Engaging in aerobic exercise in the coming week would help me to feel better:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

GO ON TO THE NEXT PAGE

27. Engaging in aerobic exercise in the coming week would improve my mental alertness:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

28. Engaging in aerobic exercise in the coming week would be boring for me:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

29. Engaging in aerobic exercise in the coming week would help to improve my muscle tone:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

30. Engaging in aerobic exercise in the coming week would help me to meet people:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

31. Engaging in aerobic exercise in the coming week would be time-consuming for me:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

32. Engaging in aerobic exercise in the coming week would help me to be physically fit:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

33. Engaging in aerobic exercise in the coming week would improve my physical appearance:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

GO ON TO THE NEXT PAGE

34. Engaging in aerobic exercise in the coming week would be healthy for me:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

35. Those people who mean the most to me believe that I should engage in aerobic exercise in the coming week:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

36. If I wanted to I could engage in aerobic exercise in the coming week:

AGREE_____:_____:_____:_____:_____:_____:_____DISAGREE
extremely quite slightly neither slightly quite extremely

37. I plan on engaging in aerobic exercise in the coming week:

LIKELY_____:_____:_____:_____:_____:_____:_____UNLIKELY
extremely quite slightly neither slightly quite extremely

38. For me to engage in aerobic exercise in the coming week is:

DESIRABLE_____:_____:_____:_____:_____:_____:_____UNDESIRABLE
extremely quite slightly neither slightly quite extremely

For items 39-44, please circle the number that best shows how certain you are that you can engage in aerobic exercise in the coming week under different conditions. For these items, "1" refers to a complete lack of certainty, and "10" means complete certainty. Circle only <u>one</u> number per item.

39. I can engage in aerobic exercise in the coming week in spite of my work schedule:

COMPLETELY UNCERTAIN 1 2 3 4 5 6 7 8 9 10 COMPLETELY CERTAIN

GO ON TO THE NEXT PAGE

40. I can engage in aerobic exercise in the coming week even when I am physically fatigued:

COMPLETELY UNCERTAIN 1 2 3 4 5 6 7 8 9 10 COMPLETELY CERTAIN

41. I can engage in aerobic exercise in the coming week even when it is boring for me:

COMPLETELY UNCERTAIN 1 2 3 4 5 6 7 8 9 10 COMPLETELY CERTAIN

42. I can engage in aerobic exercise in the coming week in spite of minor injuries:

COMPLETELY UNCERTAIN 1 2 3 4 5 6 7 8 9 10 COMPLETELY CERTAIN

43. I can engage in aerobic exercise in the coming week in spite of other time demands:

COMPLETELY UNCERTAIN 1 2 3 4 5 6 7 8 9 10 COMPLETELY CERTAIN

44. I can engage in aerobic exercise in the coming week in spite of family responsibilities:

COMPLETELY UNCERTAIN 1 2 3 4 5 6 7 8 9 10 COMPLETELY CERTAIN

For questions 45-50, please circle the number corresponding to the answer which best describes your impression.

45. Do people close to you let you know they believe your thoughts about exercising are okay?

0	1	2	3	4	5
never	very seldom	seldom	moderately	often	very often

46. Do people close to you help you think about your exercise plans or strategies?

0	1	2	3	4	5
never	very seldom	seldom	moderately	often	very often

47. Do people close to you do things like drive you to exercise class or buy exercise shorts or shoes to encourage your exercise?

0	1	2	3	4	5
never	very seldom	seldom	moderately	often	very often

48. Do people close to you do things like exercise with you or call you so you can remember to exercise?

0	1	2	3	4	5
never	very seldom	seldom	moderately	often	very often

49. Do people close to you share your joy when you've met a new exercise goal?

0	1	2	3	4	5
never	very seldom	seldom	moderately	often	very often

50. Do people close to you help you with your anger, guilt, or sadness when you aren't meeting your exercise goals?

0	1	2	3	4	5
never	very seldom	seldom	moderately	often	very often

GO ON TO THE NEXT PAGE

51. Please circle the number that shows how many of the past four weeks you have engaged in aerobic exercise. Remember that aerobic exercise uses large muscle groups and must be maintained continuously for at least 20 minutes for at least three days per week.

0 1 2 3 4

The following information about yourself will complete the questionnaire:

52. Age: _____

53. Sex: _____

54. Race: _____

55. Year in school (please circle):

freshman sophomore junior senior graduate student

56. Height: _____

57. Weight: _____

58. Smoking status (smoker/nonsmoker): _____

59. Health status (please circle):

excellent good fair poor

60. Today's date: _____

61. Did you engage in aerobic exercise during the past week (the seven day period beginning one week ago today, and including today)? Please remember the above definition of "aerobic exercise."

Yes____ No____

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!!

APPENDIX D

Factor Analysis

Factor analysis was used to explore the possibility of common dimensions underlying the variables of intention, attitude, subjective norm, perceived behavioral control, self-efficacy, outcome expectations, and perceived social support. A principal components analysis, the first step in this procedure (displayed in Table D.1), indicated that two factors accounted for 64% of the total variance for the seven variables, and that only these two factors had Eigenvalues greater than one (a criterion for judging whether or not a factor should be included in a factor analysis model; SPSS, 1990). These two factors were extracted for the factor analysis.

Table D.1. Principal components analysis for intention, attitude, subjective norm, perceived behavioral control, self-efficacy, outcome expectations, and perceived social support.

Factor	Eigenvalue	Percent of Variance Explained	Cumulative Percent Explained
1	3.29	47.1	47.1
2	1.20	17.1	64.2
3	.78	11.2	75.3
4	.59	8.4	83.8
5	.51	7.3	91.1
6	.41	5.8	97.0
7	.21	3.0	100.0

Table D.2 shows the proportion of variance in each variable explained by the two factors extracted from the principal components analysis ("communality;" SPSS, 1990).

Table D.2. Communalitites for intention, attitude, subjective norm, perceived behavioral control, self-efficacy, outcome expectations, and perceived social support.

Variable	Communality
I	.73
A	.77
SN	.55
PBC	.62
SE	.56
OE	.58
SS	.68

A varimax rotation procedure produced the factor matrix presented in Table D.3. This shows that factor one had large positive correlations with attitude, intention, outcome expectations, and self-efficacy, which pertain, respectively, to one's feelings about engaging in a behavior (good or bad), one's intention to engage in a behavior, one's beliefs about the likely consequences of a behavior and one's evaluations of these consequences, and one's beliefs about one's capacity to engage in a behavior. While interpretation is not

Table D.3. Factor matrix for the theoretical variables.

Variable	Factor One	Factor Two
A	.87	.13
I	.83	.19
OE	.76	.11
SE	.75	-.09
SN	.54	.51
SS	.32	.76
PBC	.44	-.65

straightforward, this might be thought of as a general perceived competence in, or favorable attitude toward, aerobic exercise.

Table D.3 also shows that the second factor displayed a strong positive correlation with perceived social support, and a strong negative correlation with perceived behavioral control, which reflect, respectively, "the caring, encouragement, assistance, and positive attitudes toward exercise of significant others," (Clearing-Sky, 1986, p. 13), and a lack of conviction that one can control one's own exercise behavior. It is possible that this factor reflects reliance on others (as opposed to self) for exercise motivation.

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