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Development and Testing of the Model of Health Promotion Behavior in Predicting Exercise Behavior

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〈CONTENTS〉

ABSTRACT

Introduction. Despite the fact that half of premature deaths are caused by unhealthy lifestyles such as smoking tobacco, sedentary lifestyle, alcohol and drug abuse and poor nutrition, there are no theoretical models which accurately explain these health promotion related behaviors. This study tests a new model of health behavior called the Model of Health Promotion Behavior. This model draws on elements and frameworks suggested by the Health Belief Model, Social Cognitive Theory, the Theory of Planned Action and the Health Promotion Model. This model is intended as a general model of behavior but this first test of the model uses amount of exercise as the outcome behavior.

Design. This study utilized a cross sectional mail-out, mail-back survey design to determine the elements within the model that best explained intentions to exercise and those that best explained amount of exercise. A follow-up questionnaire was mailed to all respondents to the first questionnaire about 10 months after the initial survey. A pretest was conducted to refine the questionnaire and a pilot study to test the protocols and assumptions used to calculate the required sample size.

Sample. The sample was drawn from 2000 eligible participants at two blue collar (utility company and part of a hospital) and two white collar (bank and pharmaceutical) companies located in Southeastern Michigan. Both white collar site had employee fitness centers and all four sites offered health promotion programs. In the first survey, 982 responses were received (49.1%) after two mailings to non-respondents and one additional mailing to secure answers to missing data, with 845 usable cases for the analyzing current intentions and 918 usable cases for the explaining of amount of current exercise analysis. In the follow-up survey, questionnaires were mailed to the 982 employees who responded to the initial survey. After one follow-up mailing to non-respondents, and one mailing to secure answers to missing data, 697 (71.0%) responses were received, with 627 (63.8%) usable cases to predict intentions and 673 (68.5%) usable cases to predict amount of exercise.

Measures. The questionnaire in the initial survey had 15 scales and 134 items; these scales measured each of the variables in the model. Thirteen of the scales were drawn from the literature, all had Cronbach's alpha scores above .74 and all but three had scores above .80. The questionnaire in the second mailing had only 10 items, and measured only outcome variables.

Analysis. The analysis included calculation of scale scores, Cronbach's alpha, zero order correlations, and factor analysis, ordinary least square analysis, hierarchical tests of interaction terms and path analysis, and comparisons of results based on a random split of the data and splits based on gender and employer site. The power of the regression analysis was .99 at the .01 significance level for the model as a whole.

Results. Self efficacy and Non-Health Benefits emerged as the most powerful predictors of Intentions to exercise, together explaining approximately 19% of the variance in future Intentions. Intentions, and the interaction of Intentions with Barriers, with Support of Friends, and with Self Efficacy were the most consistent predictors of amount of future exercise, together explaining 38% of the variance. With the inclusion of Prior Exercise History the model explained 52% of the variance in amount of exercise 10 months later. There were very few differences in the variables that emerged as important predictors of intentions or exercise in the different employer sites or between males and females.

Discussion. This new model is viable in predicting intentions to exercise and amount of exercise, both in absolute terms and when compared to existing models.

key words: Model of Health Promotion Behavior, exercise determinants

I. INTRODUCTION

Summary Problem Statement

Lifestyle behaviors such as tobacco smoking, alcohol consumption, sedentary lifestyle and poor nutrition account for 50% of all premature deaths in the United States (McGinnis & Foege, 1993), and efforts to improve lifestyle have become an increasingly important component of health care in the United States as evidenced by the lifestyle change goals in Healthy People 2010 Objectives (USPHS, 1998), and the development of health promotion programs designed to facilitate lifestyle changes in workplaces, hospitals and community settings. Despite the importance of healthy lifestyle practices, no models of health behavior have emerged which effectively explain or predict the practice of lifestyle behaviors.

The purpose of this study is to develop and test a new model of health behavior called the Model of Health Promotion Behavior, which was designed specifically to explain a wide range of health promotion behaviors such as exercise, eating habits, alcohol and tobacco consumption. The initial test of this model uses intentions to exercise and exercise behavior as the outcome variables. The model is described first. Then the literature on the predictors of exercise behavior is briefly reviewed to examine the extent to which the new model can apply to exercise behavior.

Model of Health Promotion Behavior

The model shown in figure 1 was developed drawing from the results of previous tests of the Health Belief Model (Rosenstock, 1974; Janz & Becker, 1984, Harrision, Mullen, and Green, 1992), Theory of Reasoned Action (Fishbein, 1980; Aizen & Fishbein, 1980; Smetana & Adler, 1980, Mansstead, Profitt, & Smart, 1983; Shtilerman, 1982; Aizen, Timko, & White, 1982; Vinonkur-Kaplan, 1978; Saltzer, 1981), Theory of Planned Behavior (Aizen, 1985; Riddle, 1980; Godin, Valois, & Shephard, Desharnais, 1987; Godin, 1993), Social Cognitive Theory (Clark, 1987; Clark, 1990; Bandura, 1986; Strecher, DeVillis, Becker, Kirscht, Eraker, & Graham-Tomasi, 1985; Chambliss & Murry, 1979; McIntyre, Lichtenstein, & Mermelstein, 1983; Condiotte & Lichenstein, 1981; Godding & Glasgow, 1985), and the Health Promotion Model (Pender, 1982; Pender, 1987; Pender, Walker, Frank-Stromberg, & Sechrist, 1990; Pender, Walker, Sechrist, & Frank-Stromberg, 1990) as discussed below.

The basic strategy used to construct the model was to identify the factors in existing models that have been shown to be effective

predictors of health behavior, and organize them in a framework that best describes the likely mechanism of their influence.

The basic framework for the model is drawn from the Theory of Reasoned Action. Variables from other models are incorporated into this basic framework. In the Theory of Reasoned Action, the Subjective Norm component is conceived and operationalized as recommended by Aizen, as the product of measures of beliefs of referents toward a behavior mutiplied times the measure of motivation to comply with referents wishes regarding that behavior.

The attitude component draws on a more complex construct than that advocated by Aizen. While Aizen measures attitude with a single construct, this model incorporates four separate constructs related to attitude that are components of the models discussed above. Each is conceived as an independent predictor of intentions, but to simplify the illustration in figure 1 only one arrow is shown between the cluster and intentions. All of these constructs (definition of health, value of health, and health and non health benefits of the behavior) are drawn from Penders Health Promotion Model. Value of health was called importance of health in Penders Health Promotion Model. All variables except value of health were important predictors of exercise in Pender's analysis (Pender, Walker, Sechrist, & Frank-Stromberg, 1990). Recognizing the failure of value of health to predict behavior in the Health Promotion Model, it is conceived here as a modifier of the health related benefits of the behavior. The model suggests that health benefits should be a good predictor to the extent that a person places a high value on health relative to other important things in life.

The prior experience variable is also added as a modifier of the relationship between each of the attitude components and intentions. This construct is drawn from Godin's work Godin, Valois, Shephard, & Desharnais, 1987) with the Theory of Reasoned Action. The model suggests intentions will be greater for people who have both a more extensive exercise history and more positive attitudes toward exercise. The reasoning is that those with exercise history will have more positive views toward exercise and thus be more interested in exercising. Cues to action, perceived competence (Smith, Dobbins, & Wallston, 1991; Sherer, 1983; Tipton, & Worthington 1984) and behavioral self efficacy are also added as direct predictors of intentions. These are drawn from the Health Belief Model, Health Promotion Model and Social Cognitive Theory, respectively. As the Strecher et al (Strecher, Becker, Kirscht, Eraker, & Graham-Tomasi, 1985) review showed, self

efficacy has been a good predictor of joining behavior change programs (Strecher, DeVillis, Becker, & Rosenstock,1986; O'Leary, 1985). Therefore, it may be reasonable to project that it is a good predictor of intentions to make a change. This linkage is also consistent with suggestions that self efficacy is the appropriate articulation of Aizen's concept of perceived control (Godin, Valois, Shephard, & Desharnais,1987). Perceived competence is a general form of self efficacy. While self efficacy is a belief that one can be successful in performing a specific behavior under specific circumstances, perceived competence is a general belief that one can be successful at any task attempted. Given this similarity, the mechanisms are postulated to be the same in this model. Given the lack of research demonstrating the impact of cues to action on intentions, there is no empirical justification for including it in the model as a predictor of intentions. However, it seems reasonable that reminders to practice a behavior would increase a person's intentions to practice that behavio

The greatest modification to the existing theories by this model is the addition of the six modifiers of the gap between intentions and behaviors. Including Barriers is consistent with Aizens (Godin, Valois, Shephard, & Desharnais, 1987) articulation of the perceived control construct, and use of self efficacy is consistent with others (Godin & Shephard, 1986) articulation of this construct. However, the Theory of Planned Behavior shows perceived control as a direct predictors of behavior. The model proposed in the present study postulates that barriers and self efficacy are more powerful as modifiers than as direct predictors. If a person has no intention of practicing a behavior, the behavior will not be practiced, even if the barriers are low and the self efficacy high. On the other hand, if a person intends to practice a behavior, the presense of low barriers and high self efficacy will help them be successful in practicing it. The same basic argument applies to perceived competence which has some similarities with self efficacy, and to social supports which can be important in overcoming barriers. Cues to action are included as modifiers instead of direct predictors because a person intending to practice a behavior might be more attentive and open to cues than a person not intending to practice the behavior. Prior experience is conceived as both a modifier of intentions and a direct predictor of behavior. It serves as a modifier of intentions when a person is able to draw on past experience to help overcome doubts or other obstacles that might make it difficult to practice the behavior. It serves as a direct predictor when the behavior is performed out of habit

without regard to cognition or affect.

Review of Determinants of Exercise Behavior

Although the Model of Health Promotion Behavior is intended to describe a wide range of health promotion behaviors, the initial test of the model used exercise as an outcome variable. Therefore, the literature on the determinants of exercise behavior was reviewed to determine if the variables in the model include the variables that have been demonstrated to be important predictors of exercise behavior.

Table 1 shows a summary of the determinants of exercise based on results of studies of supervised and unsupervised programs (Dishman & Sallis, 1994). The studies of unsupervised (free living) programs are most relevant to this study. The strongest predictors of exercise in free living situations have been high education, male gender, high income or socioeconomic status, intentions to exercise, perceived health or fitness, self efficacy for exercise, past participation in exercise, social support from family, and social support from friends. The strongest predictors of not participating have included older age, non-white race, and mood disturbances. Less consistent predictors have included having no children, not having a history of injury, enjoying exercise, expecting benefits from exercise, having a self schemata for activity, being on a diet, past participation in an exercise program, type A behavior, physician influence, and access to facilities. With one exception, the strongest non-demographic predictors of exercise are incorporated in the proposed Model of Health Promotion Behavior. The demographic factors have intentionally been excluded from the model. The one factor excluded from the model is perceived health or fitness. This factor was included in Penders Health Promotion Model also (Pender, 1982). It was intentionally excluded from the proposed Model of Health Promotion Behavior because it maybe an outcome of exercise behavior, and thus should not be considered a predictor.

With one exception, all of the strongest non-demographic predictors of not participating are also in the proposed model. The one factor not included is mood disturbances. This variable is not an important predictor of general health behavior based on the review discussed above and will not be added to the model.

Most of the less consistent non-demographic predictors of exercise are also incorporated in the model. Those not included in the model are - not having a history of injury, having a self schemata for activity, being on a diet, past participation in an exercise program, and type A Behavior. Two of these are similar to other factors in the

〈Table 1〉 Determinants of Physical Activity for Supervised Settings and with Free-Living Samples Before 1988 and between 1988 and 1991

	Supervised		Free-living	
Determinants	pre 1988	1988-1991	pre 1988	1988-1991
Demographics				
Age	00	-	-	- -
Blue collar occupation	- -	-	-	n
Childlessness	n	n	n	+
Education	+	n	++	++
Gender (male)	n	n	++	++
High risk for heart disease	-	-	-	n
Income/SES	n	n	++	++
Injury history	n n	n	+	
Overweight/obesity	-	0	-	00
Race (non-white)	n	n	-	- -
Cognitive Variables				
Attitudes	0	n	0	n
Barriers to exercise	n	-	n	- -
Control over exercisen	n	n	0	
Enjoyment of exercise	+	n	+	0
Expect health or other benefits	0	+	+	+
Health locus of control	+	0	n	n
Intention to exercise	0	n	+	++
Knowledge of health and exercise	0	n	0	0
Lack of time	- -	n	-	-
Mood disturbance	-	n	-	- -
Normative beliefs	0	n	n	0
Perceived health or fitness	++	n	-	++
Self-efficacy for exercise	+	+	+	++
Self-motivation	+	n	++	00
Self-schemata for activity	n	n	+	+
Stress	n	n	n	0
Susceptibility to illness	n	n	n	0
Value exercise outcomes	0	n	0	n
Behaviors				
Alcohol consumption	n	n	n	0
Contemporary program activity	n	n	0	n
Diet	00	n	+	0
Past free-living activity during childhood	n	n	0	0
Past free-living activity during adulthood	+	n	+	++
Past program participation	++	+	+	n
School sports participation	0	n	0	00
Smoking	- -	-	0	0
Sports media use	n	n	n	0
Type A behavior pattern	-	n	+	n
Environmenal Factors				
Social Environment				
Class size	n	+	n	n
Exercise models	n	n	n	0
Group cohesion	n	+	n	n
Physician influences	n	n	+	n
Social isolation	n	n	n	-
Past family influences	n	n	+	0
Social support from peers	n	n	+	++
Social support from spouse/family	++	n	+	++
Social support staff/instructor	+	0	n	n
Physical Environment				
Climate/season	-	n	-	0
Cost	0	n	0	n
Disruption in routine	-	n	n	n
Access to facilities: actual	+	n	n	+
Access to facilities: perceived	+	n	0	0
Home equipment	n	n	n	0
Physical Activity Characteristics				
Intensity	-	n	-	n
Perceived effort	- -	n	-	-

Key

++	repeated documented positive association with physical activity
+	weak or mixed evidence of positive association with physical activity
00	repeated documented of no association with physical activity
0	weak or mixed evidence of no association with physical activity
- -	repeated documented negative association with physical activity
-	weak or mixed evidence of negative association with physical activity
n	no data available

Source: Dishman, R., Sallis, J., Determinants and Interventions for Physical Activity and Exercise, In Bouchard, C. Shephard, R., Stephens, T. (eds) Physical Activity, Fitness, and Health: International Proceedings and Consensus Statement, Human Kinetics, Champaign, Illinois, 1994.

model; self schemata for exercise is similar to self efficacy, and past participation in an exercise program is similar to past exercise history. None of these other variables are important predictors of general health behavior based on the review discussed above and will not be added to the model.

Based on this review of the literature on well documented determinants of exercise, the model appears to incorporate most of the important determinants of exercise behavior. Some of the less important factors are not in the model, but given a balance of comprehensiveness and parsimony, the model seems to be fairly comprehensive for exercise behavior.

Ⅱ. METHODOLOGY

Design. This study utilized a cross sectional mail-out, mail-back survey design to determine the elements within the model that best explain current and predict future intentions to exercise and those that best explain current and predict future amount of exercise. All respondents to the first study were sent follow-up questionnaires 10 months after the initial survey. A pretest was conducted to refine the questionnaire and a pilot study to test the protocols and assumptions used to calculate the required sample size.

Sample. The sample was drawn from 2,000 eligible participants at two blue collar (utility company and part of a hospital) and two white collar (bank and pharmaceutical) companies located in Southeastern Michigan. Both white collar sites had employee fitness centers and all four sites offered health promotion programs. In the first survey, 982 responses were received (49.1%) after two follow-up mailings to non-respondents and one additional mailing to secure answers to missing data. This produced 845 usable cases for analyzing current intentions and 918 usable cases for analyzing amount of current exercise. In the follow-up survey, questionnaires were mailed to the 982 employees who responded to the initial survey. After one follow-up mailing to non-respondents, and one mailing to secure answers to missing data, 697 (71.0%) responses were received, producing 627 (63.8%) usable cases to predict intentions and 673 (68.5%) usable cases to predict amount of exercise. In an effort to maximize the survey response rate, most of the protocols described as Dillman's Total Response Method (Dillman, 1978) were followed. This response rate is high for this type of study with an employee population, however, it would not be sufficiently high if the purpose of this study were to measure the

〈Table 2〉 Sample Demographics by Employer Site

		pharmaceutical	bank holding		
	All respondents	company	company	utility	hospital
Exercisers	64.1%	70.0%	70.2%	54.8%	58.4%
Age (mean)	37.7	36.6	35.5	41.7	38.1
# of children (mean)	1.4	1.1	1.2	2.1	1.4
gender					
male	42.1%	41.9%	33.7%	89.2%	13.7%
female	57.9%	58.0%	66.3%	10.8%	86.3%
marital status					
married	66.9%	67.6%	65.5%	75.2%	61.4%
widowed	1.2%	2.0%	1.2%	0.5%	1.3%
divorced	12.6%	5.4%	12.7%	14.8%	17.2%
never married	19.2%	25.0%	20.5%	9.4%	20.2%
employment					
full time	91.3%	94.6%	94.9%	99.0%	77.2%
part time	8.2%	5.4%	5.1%	0.5%	21.6%
retired	0.4%	0.0%	0.0%	0.5%	1.3%
highest education					
some high school	0.5%	0.0%	0.3%	2.0%	0.0%
high school graduate	14.4%	2.9%	7.8%	42.4%	9.4%
some college	36.6%	18.4%	32.5%	51.2%	45.5%
college graduate	32.1%	40.3%	44.0%	3.0%	33.5%
graduate schoo	16.4%	38.4%	15.4%	1.5%	11.6%
family income					
below $20,000	2.6%	0.0%	2.1%	0.5%	7.6%
$20,000 to $40,000	27.0%	19.1%	25.0%	34.0%	30.5%
$40,000 to $59,999	29.9%	21.2%	26.2%	47.9%	28.3%
$60,000 to $79,000	19.5%	24.0%	20.4%	12.9%	19.7%
$80,000 or more	21.0%	35.8%	26.2%	4.6%	13.9%
Race					
Arab American	0.5%	0.0%	1.5%	0.0%	0.0%
Asian American	2.1%	4.9%	1.5%	0.0%	2.2%
Black/African American	9.2%	2.0%	8.5%	12.4%	13.4%
Hispanic/Latino	1.4%	4.9%	0.0%	0.0%	2.2%
Native American	1.8%	4.9%	0.9%	4.5%	1.7%
White/Caucasian	83.8%	90.7%	86.7%	77.1%	79.7%
Other	1.2%	1.5%	0.9%	2.0%	0.9%
Residence					
urban	18.1%	20.9%	9.0%	20.9%	26.2%
suburban	64.4%	56.3%	86.4%	48.3%	53.7%
rural	17.5%	22.8%	4.5%	30.8%	20.1%

characteristics of the respective workforces. However, it is sufficiently high to determine the relationships between the various factors in the model. Demographics and percent of respondents who classify themselves as exercisers are shown for all respondents and by site in Table 2. The fact that more than two thirds of the respondents are exercisers does suggest some bias toward exercisers among respondents. This is recognized as a possible limitation in the discussion section.

Measures. The Model of Health Promotion Behavior has 14 distinct constructs which were measured using the questionnaire in the first survey. The questionnaire in the follow-up survey included only the outcome measures of intentions and amount of exercise. All of the scales had Cronbachs alpha values over .7 and most had values over .8 in this study and earlier reported uses of the scales. Those with values below .8 were the Health Benefits subscale of the Benefits of Exercise scale (.7900), Beliefs of Important Others (.7427), and Confidence in Ability to Exercise scale (.7822). Each scale is discussed briefly below.

The **Value scale** had nine items such as "a comfortable life (a prosperous life) is more important to me than HEALTH (physical and mental well being)." Likert type scale response categories ranged from 1 for "strongly agree" to 6 for "strongly disagree." This scale was adapted from a scale developed by Wallston (Wallston, 1992), with his assistance.

The **Definition of Health** construct is measured with 16 items, 7 of which measure the clinical definition of health and 9 of which measure non-clinical definition of health. Items typical of the clinical definition of health include "Health, or 'being healthy' means not requiring a doctors' services." Items typical of the non-clinical definition of health include "Health, or 'being healthy' means feeling great--on top of the world." Likert type scale response categories ranged from 1 for "strongly agree" to 6 for "strongly disagree" (Lusk, Kerr, & Baer, 1994).

Benefits of Exercise included subscales for health benefits and non-health benefits. The 6 item health benefits scale was developed by Steinhart (Steinhart & Dishman, 1989) and includes items such as "Regular exercise can improve my blood pressure." The 10 item non-health benefits scale developed by Marcus et al. (Marcus, Rakowski, and Rossi, 1992) includes items such as "Regular exercise can give me more energy for my family and friends." Likert-type scale response categories ranged from 1 for "strongly agree" to 6 for "strongly disagree" for both scales.

Beliefs of Referents toward behavior was measured on a five-item scale preceded by the introductory question "How important is it

to each of the following people that you participate in regular exercise during your free time in the next year?" Individual items measured this for close friends, co-workers, spouse or significant other, members of family other than spouse or significant other, and physician or other health care provider. Responses were recorded on a Likert type scale with categories ranging from 1 for "extremely important" to 5 for "not at all important" and 6 "does not apply." This scale was adapted from a very similar scale used by Godin (1993).

Motivation to comply with referents was measured with a five-item scale developed by Godin (1993). The items preceded by the introductory question "How important is it to you that your exercise behavior follows the wishes of each of the people below?" Individual items corresponded to the people in the beliefs of referents scale.

Subjective norms was measured indirectly by multiplying the score on the Beliefs scale for each individual type of person by the score on the Comply scale, then averaging the value of the products (Godin, 1993).

Intentions was measured with the one item statement "I intend to exercise on a regular basis during my leisure time in the next 6 months" followed by the Likert type scale response categories ranging from 1 for "strongly agree" to 6 for "strongly disagree." This structure was taken directly from Godin (Godin, Valois, Shephard, & Desharnais, 1987).

Current Exercise behavior was measured with four items. The first item asked "Do you exercise in your leisure time on a regular basis" and was followed by bi-polar "yes" or "no" response categories. Rather than define "regular exercise" for the subject, the next three items measured duration (minutes per session), frequency (sessions per week), and intensity (portion of exercise causing sweating or hard breathing). Amount of exercise was calculated by multiplying values for the duration question times the frequency question times the reverse of the intensity question. This scale was developed for use in the Minnesota Heart Health Program. In a comparison with the nine other most commonly used scales, this scale had excellent validity (Jacobs, Ainsworth, Hartman, & Leon, 1993). Using amount of exercise as the outcome variable addresses many of the concerns highlighted by Sallis (Sallis & Hovell, 1990a; Sallis & Hovell, 1990b) in using only a presence or absence of exercise measure, or any of the other individual components of amount of exercise.

Measurement of **Supports** was limited to social support, using a 26-item scale developed by Sallis (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). Half of the items measured support from friends and half from

family. The items were preceded by the question "During a usual month, how much do your family or friends do the following with you?" this was followed by 13 phrases such as "exercised with me," "gave me rewards for exercising," and "complained about the time I spend exercising." Separate answer categories for family and friends were provided. Response categories ranged from 1 for "never" to 5 for "very often" and 6 for "does not apply."

Barriers was measured with a 15-item scale developed by Steinhart (Steinhart & Dishman, 1989). The items were preceded by the question "When you don't exercise on a regular basis, how often do each of the following keep you from exercising?" This was followed by items such as "I am too busy," "bad weather interferes, " and "exercise tires me out." Likert type response categories ranged from 1 for "never" to 5 for "very often."

Perceived competence was measured with an 8-item scale developed by Wallston (1989). Items included "I handle myself well in whatever situation I'm in," "I succeed in the projects I undertake," and "I find my efforts to change situations I don't like are ineffective." Response were recorded on a 6 point Likert type scale with categories ranging from 1 for "strongly agree" to 6 for "strongly disagree."

Behavior self efficacy was measured with a five-item scale developed by Marcus (Marcus, Selby, Niaura, & Rossi, 1992). Items were preceded by the question "How confident are you that you could exercise in each of the following conditions? with items such as "when I am tired" and "when I feel I don't have time." Responses were recorded on a 5-point Likert type scale with categories ranging from 1 for "extremely confident" to 5 for "not confident at all."

No scales for **Cues to Action** were found in the literature or after consulting with experts. Therefore, a six item scale was developed. Items were preceded by the question: "How often are you encouraged to exercise by messages you see or hear from the following sources:" with items such as "on television," "from your family" and "from your employer." Likert type response categories ranged from 1 for "never" to 5 for "very often." Chronbach alpha scores of .84 were achieved in this test of the scale.

No scales for **Prior Experience** were found in the literature or after consulting with experts. Therefore, a four-item scale was developed. The four items were preceded by the instructions: Circle the level of exercise that best describes how much you exercised during the various stages of your life. Mark only those life stages you have already passed." The four items corresponded to

stages of life: "childhood (up to age 13 years)," "adolescence (14 to 22 years)," "early adulthood (23 to 30 years)," "mid adulthood (31 to 45 years)." Response categories ranged from 1 for "sedentary (avoid exercise)" to 5 for "extremely vigorously active (more than 5 hours per week)." In the analysis of the second survey, amount of exercise reported in the first survey was also used as a measure of prior experience. Chronbach alpha scores of .87 were achieved in this test of the scale.

Nine items measured **demographics** including age, gender, marital status, number of children by age group, employment status, education level, family income, race and residence. Questions on age and numbers of children by age category required that answers be written in. Response categories were provided for all the other questions.

The questionnaire included four additional scales which were not used in this study but were included for future research. These included a two-item scale measuring exercise at work which was part of the leisure time exercise scale (Jacobs, Ainsworth, Hartman, & Leon, 1993), a previously untested three-item scale measuring type of exercise, a previously untested two-item scale measuring participation in supervised exercise program, and a one-item scale measuring stage of exercise (Cohen & Cohen, 1983).

Analysis. The analysis included calculation of scale scores, Cronbach's alpha values for each scale, zero order correlations between all variables, factor analysis of the predictor scale scores, ordinary least square analysis, stepwise regression, and hierarchical tests of interaction terms. Stepwise regression was used to determine the relative importance of the many variables in predicting future intentions and future exercise and to reduce the number of variables in the model.

In the initial ordinary least squares analysis the data was split in random halves to test and confirm the model. Due to no substantial differences in the model produced by the two data sets, the data halves were recombined into one data set for the all of the tests of the model reported here. Analyses were repeated with splits based on gender and employer site. The power of the regression analysis was .99 at the .01 significance level for the model as a whole (Cohen & Cohen, 1983).

Missing data on individual items was minimal, but some entire scales were not completed. None of the questionnaires had more than three individual items blank within any scale, and none had more that 25% of its items missing. Missing data was ignored in the averaging process as long as at least 75% of the items in the scale were answered. To calculate the average, missing data was omitted from the numerator and the

denominator. Any cases containing missing data on scale scores were eliminated from the analysis by listwise deletion.

Ⅲ. RESULTS

Orthogonal factor analysis was conducted to determine if all of the scales measured distinct constructs and those conceived as similar loaded on common factors. The factor analysis showed that similar constructs loaded on common factors when the number of factors were limited, but not to an extend that any of the constructs should be combined. The factor analysis also showed that the social support scale should be divided into two scales, one for support from friends and one for support from family. (Note: data on the factor analysis are not shown in the model.)

Note: In the discussion below, time one refers to the time the first questionnaire was mailed. Time two refers to the time the follow-up questionnaire was mailed, about 10 months later.

Zero order correlations. Zero order correlations were conducted to determine the general relationship between the constructs and to determine which had the highest zero order correlations with the outcome variables. Correlations between the primary scale variables conceived to predict intentions were low, with most under .20 and all under .33. Correlations between interactions variables possessing the same term were high as expected, with most above .60 some reaching .93. Correlations between the primary scale variables conceived to predict amount of exercise were also low, with most under .25, but the correlation between the two social support subscales was .338 and between the barriers and self efficacy scales was .46. Correlations between interactions variables possessing the same term were also high as expected, with most above .50 nine greater than .8 and one reaching .93. (Note: date on the above correlations is not shown in the tables).

Zero order correlations for all the variables with future intentions (time two) are shown in Table 3. Non-health benefits had the highest zero order correlation with Intentions , by itself explaining 16.8% of the variance in future intentions. After that, there was a sharp drop in the correlation levels, but all except one variable (Clinical Definition of Health) had correlations with intentions that were significant at the .02 level or lower. Zero order correlations with amount of future exercise (time two) are shown in Table 4. The variables with the highest zero order correlations with amount of future exercise were the interaction terms of Intentions times

〈Table 3〉 Correlations with Future Intentions

Variable	Correlation	Variance Explained	p	rank
intentions time 1	0.595	0.354	<.0001	na
Benefits(Non Health)	0.41	0.168	<.0001	1
Benefits(Health)	0.319	0.1018	<.0001	2
Interaction: Prior Experience x Benefits (Non Health)	0.317	0.1005	<.0001	3
Self Efficacy	0.3	0.09	<.0001	4
Interaction: Benefits (Health) x Values x Prior Experience	0.295	0.087	<.0001	5
Interaction: Prior Experience x Benefits (Health)	0.282	0.0795	<.0001	6
Interaction: Benefits (Health) x Values	0.255	0.065	<.0001	7
Interaction: Values x Prior Experience	0.232	0.0538	<.0001	8
Interaction: Prior Experience x Wellness Definition of Health	0.198	0.0392	<.0001	9
Prior Experience	0.175	0.0306	<.0001	10
Values	0.151	0.0228	1E-04	11
Interaction: Prior Experience x Clinical Definition of Health	0.138	0.019	5E-045	12
Wellness Definition of Health	0.131	0.0172	0.002	13
Personal Competence	0.122	0.0149	0.002	14
Cues to Action	0.121	0.0146	0.002	15
Norms	0.098	0.0096	0.098	16
Clinical Definition of Health	0.022	0.0005	0.58	17
demographics				
education	0.098	0.0096	0.012	(16)
# of kids	-0.09	0.0081	0.022	(17)
age	-0.06	0.0036	0.252	(17)
income	0.031	0.001	0.426	(17)

Barriers and Intentions times Self Efficacy. By themselves these explained 27.7% and 27.7% of the variance at time two. There were substantial correlations with many of the other variables and all except one (Cues to Action) were significant at the .005 level or lower.

Regression Analysis. In working with interaction terms in regression analysis, the standard procedures would be to first enter the primary variables in the model, retain these in the model through forced entry, then add the interaction terms. This procedure was modified slightly in this analysis due to the mechanisms conceived in the model. As explained earlier, the interaction variables were conceived as more important predictors than the primary variables. For example the Barriers to Exercise Scale was conceived to be an important predictor only when the

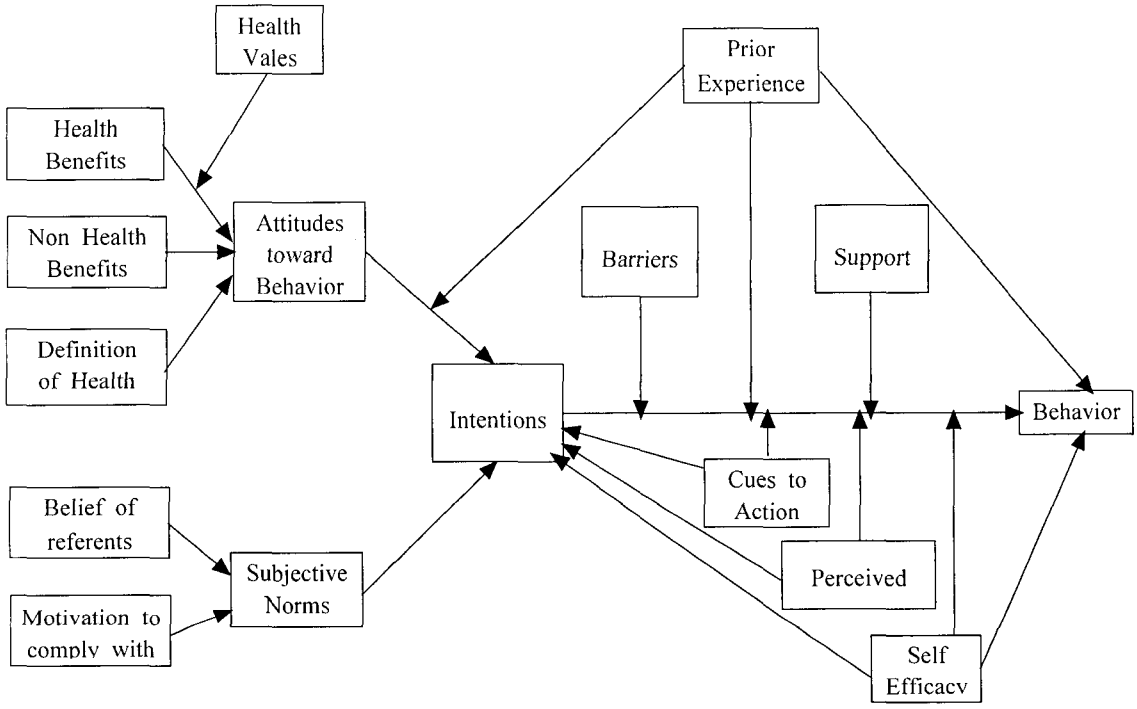
〈Table 4〉 Correlations with Amount of Future Exercise

Variable	Correlation	Variance Explained	p	rank
amount of exercise time 1	0.691	0.4775	<.0001	na
Interaction: Intentions x Berriers	0.526	0.2767	<.0001	1
Interaction: Intentions x Self Efficacy	0.526	0.2767	<.0001	1
Interaction: Intentions x Prior Experience	0.501	0.251	<.0001	3
Interaction: Intentions x Personal Competence	0.443	0.1962	<.0001	4
Intentions	0.437	0.191	<.0001	5
Self Efficacy	0.415	0.1722	<.0001	6
Berriers	0.402	0.1616	<.0001	7
Interaction: Intentions x Support from Friends	0.387	0.1498	<.0001	8
Prior Experience	0.312	0.0973	<.0001	9
Support from Friends	0.276	0.0762	<.0001	10
Interaction: Intentions x Support from Family	0.25	0.0625	<.0001	11
Interaction: Intentions x Cues to Action	0.243	0.059	<.0001	12
Personal Competence	0.164	0.0269	<.0001	13
Support from Family	0.108	0.0117	0.005	14
Cues to Action	-0.014	0.0002	0.722	15
demographics				
# of kids	-0.18	0.0324	<.0001	(13)
education	0.167	0.0279	<.0001	(13)
age	-0.097	0.0094	0.013	(15)
income	0.068	0.0046	0.084	(15)

Intentions to Exercise measure was high. Therefore, the initial analysis was done with the primary variables only, but when the interaction terms were added, the primary variables were not forced. (Results on the initial analysis not shown in the tables).

Intentions. Intentions to exercise at time 2 was first regressed on the primary variables conceived to predict intentions using stepwise regression for the total sample. Non-Health Benefits and Self Efficacy emerged as significant predictors, with an adjusted R square of 19.6%. Non-Health Benefits emerged first, with an adjusted R square of 16.6%. When the interaction terms were included, those two variables remained, and the interaction term of Health Benefits times Values times Prior Experience emerged as a statistically significant predictor, increasing the adjusted R square to 20.4%.

Due to multicollinearity caused by the interaction variables, the coefficients were not meaningful and are not discussed here or shown in the tables.



〈Figure 1〉 Model of Health Promotion Behavior(original conceptual model)

The emerging model of the predictors of future intentions is shown on the left side of figure 2 and the variance explained by each variable is shown in table 5.

Amount of Exercise. When amount of exercise at time 2 was regressed on the primary variables conceived to predict amount of exercise, Intentions, Barriers, Prior Experience, Self Efficacy, Social Support from Friends and Cues to Action emerged in that order as significant predictors, together with a combined adjusted R square of 33.8% (Data not shown in tables). When the interaction variables were included, all of the primary variables except Social Support from Friends and Self Efficacy dropped out. The variables that emerged, in the order they emerged were the interaction terms of Intentions times Self Efficacy, Intentions times Prior Experience, Intentions times Social Support from Friends, Social Support from Friends, Intentions, Intentions times Barriers, and Self Efficacy. Barriers emerged at the third step but was dropped at the ninth step and Intentions times Cues emerged at the fifth step but was dropped at the tenth. Together, these variables had a combined adjusted R square of 38.0%. The variance explained by each variable is shown in Table 5.

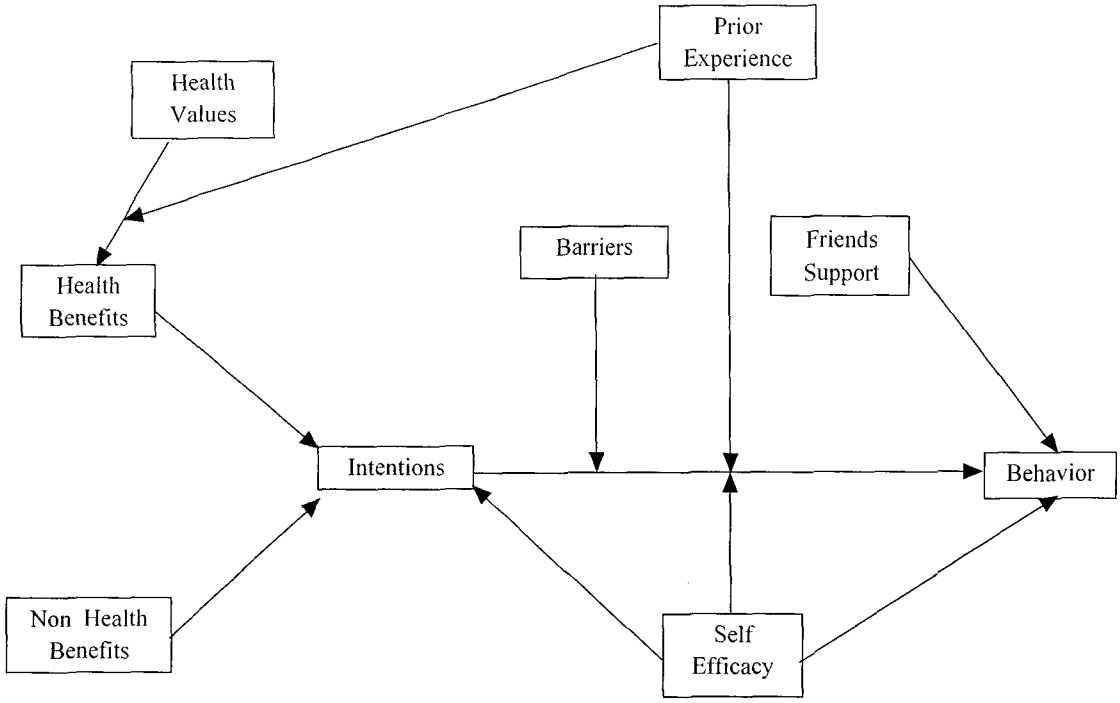
As shown in Table 4, amount of exercise at time one had the highest zero order correlation with amount of exercise at time two at 69.1%. The original measure of prior experience (as explained in the description of measures above) had the third highest correlation at only 50.1%. By itself amount of exercise at time one explained 47.75% of the variance in exercise at time two. To avoid obscuring the impact of the other variables it was held out of the initial regression analyses. To test the additional contribution it could make, especially relative to the other measure of prior experience, the variables shown in the previous analysis to be significant predictors of Amount of Exercise excluding the Interaction of Intentions with Prior Experience were forced, then Amount of Exercise at time 2 was regressed on Amount of Exercise at time one, and the interaction terms of Intentions times Amount of exercise at time one and Intentions times Prior Experience. The other variables had a combined adjusted R square of 34.6%; Intentions times Amount of exercise at time one emerged first, increasing the combined adjusted R square to 50.2%, followed by Intentions times Prior Experience which increased the combined adjusted R square to 51.9%. The model emerging for males and females combined in this analysis is shown in the right side of Figure 2.

The same regression analyses were repeated with the data split for women and for men. The significant predictors of Intentions to Exercise at time two for women were Self Efficacy, Non- Health Benefits and the Interaction of Prior Experience with Health Benefits, emerging in that order with a combined adjusted R Square of 22.0%. Predictors of Amount of Exercise at time two for women were the Interaction of Intentions times Self Efficacy, Intentions times Barriers, Prior Experience, Intentions, Self Efficacy, and the Interaction of Intentions times Support from Friends, emerging in that order with a combined R Square of 38.8%. Those variables were forced in the stepwise regression then amount of exercise at time two was regressed on the Interactions of Intentions times Prior Experience, Intentions times Amount of Exercise at time one, and Amount of Exercise at time one. The interaction of Intentions times Amount of Exercise emerged as a significant predictor, raising the combined adjusted R Square from 39.7% to 49.4%. These results are generally consistent with the results for men and women combined. In predicting future Intentions for women, Self Efficacy and Non Health Benefits were still the most important variables, but the interaction variable of Health Benefits times Prior Experience times Values was simplified to Health Benefits

〈table 5〉 Variance Explained in Future Intentions, and Future Amount of Exercise for all Participants, Women Only, and Men Only

Future Intentions	incremental variance explained	total variance explained
Total sample(males and female, n= 630)		
Non Health Benefits	16.60%	16.60%
Self Efficacy	3.00%	19.60%
Interaction: Health Benefits x Values x Prior Experience	0.80%	20.40%
Females only (n= 378)		
Self Efficacy	15.70%	15.70%
Benefits (Non Health)	4.80%	20.50%
Interaction: Benefits (Health) x Prior Experience	1.50%	22.00%
Males only (n= 250)		
Benefits (Non Health)	20.50%	20.50%
Future Amount of Exercise		
Total sample (males and females, n= 678)		
Interaction: Intentions x Self Efficacy	27.50%	27.50%
Interaction: Intentions x Prior Experience	4.10%	31.60%
Barriers (entered at step 3, dropped at step 9)	2.50%	34.10%
Interaction: Intentions x Social Support from Friends	1.10%	35.20%
Interaction: Intentions x Cues to Action (entered at step 5, dropped at step 10)		36.00%
Social Support from Friends	0.40%	36.40%
Intentions	0.90%	37.30%
Interaction: Intentions x Barriers	0.80%	38.10%
Self Efficacy	0.30%	38.00%
(variables below were entered after variables above, except Prior Experience, were forced)		
Interaction: Intentions x Amount of Exercise time one	15.60%	50.20%
Interaction: Intentions x Prior Experience	1.70%	51.90%
Females only (n= 400)		
Interaction: Intentions x Self Efficacy	29.20%	29.20%
Interaction: Intentions x Barriers	2.80%	32.00%
Prior Experience	2.60%	34.60%
Intentions	0.70%	35.30%
Self Efficacy	2.80%	38.10%
Interaction: Intentions x Social Support from Friends	0.70%	38.80%
(variables below were entered after variables above, except Prior Experience, were forced)		
Interaction: Intentions x Amount of Exercise time one 10.60%		49.40%
Males only (n= 278)		
Interaction: Intentions x Prior Experience	29.80%	29.80%
Interaction: Intentions x Social Support from Friends	3.60%	33.40%
Barriers	2.90%	36.30%
Cues to Action	1.30%	37.60%
(variables below were entered after variables above, except Prior Experience, were forced)		
Interaction: Intentions x Amount of Exercise time one	23.70%	54.30%
Interaction: Intentions x Prior Experience	1.60%	55.90%

times Prior Experience. In predicting Amount of Exercise, Prior Experience was important as a primary variable instead of an interaction variable, and Support from Friends



〈Figure 2〉 Model of Health Promotion Behavior(reduced empirical model for amount of exercise)

was important only as an interaction variable and not as a primary variable. The interaction variable of Intentions time Amount of Exercise at time one remained important.

With men, only Non Health Benefits Emerged as a significant predictor of Intentions, by itself showing an adjusted R Square of 20.5%. In predicting Amount of Exercise at time two, only four variables emerged as important predictors, the Interactions of Intentions times Prior Experience, Intentions times Social Support from Friends, Barriers and Cues to Action, with a combined adjusted R Square of 37.6%. When those variables were forced and Amount of Exercise at time two was regressed on the Intentions times Prior Experience, Intentions times Amount of Exercise at time one, and Amount of Exercise at time one, the two interaction terms emerged as significant predictors, raising the combined adjusted R Square to 55.8%. The results for men are somewhat consistent with those for women, but the model predicting amount of exercise is not as meaningful because the primary variable of intentions dropped out.

Demographics. Demographic variables of number of kids, and age were negatively correlated and education and income were

positively correlated with future intentions and amount of future exercise for both males and females, however the correlations were smaller than most of the variable included in the model. For women, the highest correlation was between amount of exercise at time two and number of kids, at -18.1%. For men, the highest correlations were amount of exercise at time two and number of kids at -24.0% and education level at 21.1%. For the group as a whole, the highest correlations among demographic variables were amount of exercise at time two and number of kids at -18.0% and education level at 16.7% (Data not shown in tables).

When amount of exercise at time two was regressed on the demographic variables, using stepwise regression, by themselves, for the group as a whole and for women, the demographic variables explained only 4.7% of the adjusted variance, with number of kids explaining 3.2% by itself, and education explaining the balance. For men, they explained 8.1%, with number of kids explaining 5.7% by itself, and education explaining the balance. Only education remained when intentions at time two was regressed on the demographic variables, explaining 1% of the variance for the group as a whole, but none of the variance for the males or females considered separately (Data not shown in tables).

When included in the model predicting amount of exercise at time two in a stepwise regression, only number of kids remained, by itself explaining an additional 1.2% of the variance for the group as a whole, .9% for women, and 2.9% for men. When included in the model predicting intentions at time two in a stepwise regression, only number of kids remained, by itself explaining only an additional .8% of the variance for the group as a whole, and not remaining for women or men. These data on demographic variables are included here to show that demographic variables were less important than the variables in the model in predicting future intentions and future amount of exercise. Demographic variables are not included in this model.

Ⅳ. DISCUSSION

This new model is viable in predicting future intentions to exercise and amount of exercise, both in absolute terms and when compared to existing models.

Regression Analysis. The model explained just over 20% of the variance in future intentions to exercise. Non Health Benefits and Self Efficacy were the most powerful predictors of intentions within the model. The model also explained almost 52% of the

variance in amount of future exercise. Self Efficacy, Support from Friends, Intentions, and the interaction of Intentions with Barriers, with Support of Friends, and with Self Efficacy and with Prior Exercise were the most consistent predictors of amount of future exercise.

Interaction terms. The results demonstrate that the interaction terms are more powerful predictors of amount of exercise than the direct variables, and support the configuration of the model in the figures showing interaction terms versus direct variables as predictors. First, the interaction terms were stronger zero order predictors than the direct variables. For example, as shown in table 5, the interaction of Intentions and Barriers explained 27.7% of the variance while Barriers by itself explained 16.2% and Intentions by itself explained 19.1%; the interaction of Intentions and Self Efficacy explained 27.7% of the variance while Self Efficacy by itself explained 17.2%. When the interaction terms were entered into the model after all the direct variables were forced, the variance explained increased 4.2%. This also occurred when done with isolated variables. For example, post hoc analysis showed that the combined adjusted R Square for Intentions was 18.9%. When Barriers was added, the combined adjusted R Square increased to 25.0%. When the interaction of Barriers and Intentions was added, it increased to 26.7%. When the interaction term of Intention time Barriers variable was entered by itself, the combined adjusted R Square was 27.3%. The same pattern emerged when this test was conducted with Self Efficacy, Support from friends, and was most pronounced with Prior Experience. These empirical results support the conceptual argument made earlier that the greater amounts of exercise will be more likely when the Intentions to exercise are high and Barriers are low, Self Efficacy is high, Prior Experience is high etc.

Improvements on Predictive Value of Health Benefits. As discussed earlier, the interaction term of Health Benefits with Values and Prior Experience was conceived to improve the ability of Health Benefits to predict Intentions to Exercise. Including this interaction term in the model did increase the variance explained slightly, .8%. While only a modest improvement, this configuration may be worthy of further study.

Improvements on the Predictive Ability of the Theory of Planned Behavior. These results provide further support for the already strong arguments for the advantages of the Theory of Planned Behavior over the Theory of Reasoned Action. First, the zero order correlations of Amount of Exercise with Self Efficacy (41.5%) and with Barriers (40.2%),

(the two common measures of the Control feature in the Theory of Planned Behavior), were comparable to those of Intentions (43.7%). Second, when these were added to a stepwise regression model in post hoc analysis, the combined adjusted R Square increased significantly. By itself, Intentions explained 18.9% of the variance in future exercise. When Intentions were forced and Barriers were added, the variance explained increased to 25.0%. When Intentions were forced and Self Efficacy added, the variance explained increased to 24.8%.

These results also support the inclusion of both measures of control, Self Efficacy and Barriers and the other variables in this model, Support of Friends, and Prior Experience. When all of these were included, the variance explained in amount of future exercise to 38.0%, an increase of 13% over the variance explained by the variables in the Theory of Planned Action. When amount of exercise at time one was used as a measure of Prior Experience, the variance explained in future exercise increased to 51.9%, almost double the variance explained by the variables in the Theory of Planned Behavior.

Comparisons to previous research and other models. These results remain strong when compared to results in previous analyses.

Comparing these results to the results reported by Godin and Kok 1996) in a review of studies applying the Theory of Reasoned Action and Planned Behavior show that this model was not as good in predicting future intentions but better in predicting amount of future exercise. In the 20 studies that reported variance explained in Intentions, the average was 30%, which is higher than the 20% found in this study for future intentions. In the 14 studies that reported variance explained for exercise, the average was 35.6%, which is lower than the 51.9% found in this study. Like this study, Godins review also showed that Norms were not a strong predictor of Intentions.

These results are also better than the results found by Pender (1990) in testing the Health Promotion Model. That model was able to explain 21.6% to 42.4% of the variance in baseline exercise among four populations, and 26.1% of future exercise.

Comparisons to the Health Belief Model are more difficult because most of the reported studies do not report the variance explained. For example, a review and meta analysis of the literature by Harrison et al. (1992) found no studies related to exercise behavior that reported variance explained. The average variance explained for all the behaviors in all the studies ranged from .01% to 9.0% for each of the individual four elements of the model, and the highest

variance reported in any of the studies was 29% (Kirscht, 1978).

Implications for Practice

Application of this model can have a potentially significant impact on health promotion practice, not because the results suggests anything that will startle practitioners, but because they provide a structure within which to design and implement programs, and a theoretical framework that reflects what many have discovered in practice but have not seen confirmed in their professional training or the scholarly literature.

First, these findings reinforce Prochaskas (Prochaska & Velicer, 1997) recommendations that interventions be designed to address the **stage** of the program participant. For example, this study showed that level of Non-Health Benefits was the most important correlate of Intentions to Exercise, explaining 22.8% of the variance in current and 16.8% of future Intentions, and Intentions was involved as a direct or interaction variable in all but two of the variables that had a significant contribution to explaining Exercise. However, post hoc analysis showed that by itself, Non-Health Benefits explained only 5.8% of the variance in Exercise directly, and once Intentions to Exercise was controlled for, Non-Health Benefits explained none of the variance. This means that practitioners should spend time discussing the Non-Health Benefits of exercise with those who have low intentions to exercise, but once a person has high intentions to exercise, discussing benefits is not a good use of the professional's or the client's time. At that point, the professional should shift attention to the factors that explain exercise behaviors for those with high intentions, namely, enhancing self efficacy, reducing barriers, and enhancing support from friends. This approach may not change the repertoire of skills or even the necessary knowledge of the professional, but by clarifying when and with whom specific strategies are most effective, it should make better use of their time and increase the likelihood of helping their clients.

Findings on the most effective time to build **Self Efficacy** were different. Self efficacy was an important predictor of intentions to exercise, and an important predictor of exercise, even after level of intentions was controlled. Therefore, efforts to enhance or maintain self efficacy are important for program participants who have high intentions and those who have low intentions.

Similar findings emerged for Support from Friends. The analysis showed that it was a consistent correlate of exercise, even after controlling for Intentions, Self Efficacy, and Barriers. Post hoc analysis showed that it was

a valuable correlate of Intentions, explaining 8.5% of the variance by itself, and even after controlling for Non-Health Benefits and Self Efficacy, explaining an additional 2.0% of the variance. Given the post-hoc nature of this analysis of the impact of Support from Friends on Intentions, the model will not be refined until these results are confirmed through further analysis, but these findings suggest that efforts to enhance support from friends will be helpful for those with low intentions and those with high intentions.

The finding that the **Interaction of Barriers with Intentions** was the most important correlate of exercise is very important and should stimulate additional program development efforts. While the importance of barriers is beginning to be recognized in theoretical work, and many practitioners recognize the importance of barriers that prevent their clients from exercise, little has been done at the practice level to develop protocols to help people change their perception of barriers or to reduce actual barriers. To be successful in this endeavor, health promotion professionals need to temporarily put aside their health related training and draw on their experience as problem solvers in daily living. They need to learn how to help people figure out how to rearrange their schedules to make time for exercise, develop exercises they can do with their families, develop plans for how to exercise at their desk, during trips or when the weather is bad, and overcome the other barriers preventing them from exercising. Given the little applied work that has been done in this area, rapid progress is very possible if it receives focused attention.

The finding that **Non-Health Benefits** are a more important correlate than Health Benefits is also very important. This finding is probably not surprising to health promotion professionals with years of practice, but it may be surprising to many health educators, nutritionists, exercise physiologists, nurses, physicians and other clinicians just entering practice. Conscious of the health benefits of exercise, many new professionals stress health benefits when trying to convince their clients to exercise. Only after years of practice do they realize that many of their clients are not motivated to exercise by the health benefits. They find that health benefits sometimes attract the attention of clients who are dealing with health problems of their own or of their friends, but other benefits such as having fun, spending time with family or friends, improving appearance or self image and more energy are often more important in convincing them to finally start exercising. The important conclusion to draw here is not to eliminate discussion about health benefits of exercise, but to discuss them in the

context of all the other benefits.

The finding that **Cues to Action** was at best a minor factor in explaining exercise is potentially important in terms of helping professional decide where not to spent their time. Post hoc analysis showed that Cues to action was also not an important correlate of Intentions, by itself explaining only 2.2% of the variance, and explaining no additional variance when Non Health Benefits and Self Efficacy were controlled for. There has been very little empirical work to measure the impact of cues to action on behavior despite the fact that many large and small scale health promotion programs have been implemented to provide cues to action. The findings here that cues to action do not have much impact are not sufficient to recommend discontinuing the many programs designed around this construct, but more work should be done to determine if these cues to action can indeed have a beneficial impact. It is important to note that these conclusions must be tempered by the reminder that this scale was developed for this study and its psychometric properties have not been fully established.

The findings that **Values,** and **Definition of Health** are not particularly important within the context of the model is not especially important because these constructs have not yet gained much exposure or application. Therefore these findings will not change or reinforce existing practice.

The finding that **Personal Competence** was not an important predictor of future Exercise after Self Efficacy was controlled for is useful, because it demonstrates that efforts to enhance specific beliefs about being able to perform a behavior (Self Efficacy) are probably more important than more general beliefs about competence (Personal Competence) in enhancing exercise behavior. However the finding that Personal Competence was a powerful zero order correlate of current and future exercise and important within the context of the model explaining current exercise suggests that this is an important construct which needs to be further explored, especially in situations in which self efficacy cannot be measured or enhanced.

The finding that **Subjective Norms** were not an important correlate of Intentions was consistent with previous research already cited, but was surprising to this author based on personal experience, especially when Support from Friends was an important correlate for both Exercise and Intentions. Post hoc analysis showed that Norms were also not important as direct correlates of Exercise. Combined with the relatively low reliability measure of the Beliefs in the Wishes of Important Others scale, these

results are difficult to interpret. However, at the practice level, the recommendation above to enhance Support from Friends allows the practitioner to create situations in which norms to exercise are enhanced without requiring the justification for such efforts to come from empirical support for the power of norms.

In summary, given limits on time and resources experienced by all health promotion practitioners, the greatest progress might be made by encouraging people to exercise by providing different programs for those with high and low intentions to exercise. For those with low intentions to exercise, they might concentrate on the benefits of exercise, with a focus on the non-health benefits, and enhancing self efficacy to exercise. For those with high levels of intentions to exercise, efforts might be best spent on enhancing and maintaining high levels of self efficacy, helping clients reduce barriers that keep them from exercising, and programs to bolster support to exercise from friends. Also, faculty members responsible for training health promotion professionals need to examine what they teach and determine how consistent it is with empirical findings. For example, training programs typically focus some attention on self efficacy and this should continue and expand. Greater emphasis needs to be placed on learning how to overcome barriers and teaching professionals these skills. Benefits of exercise beyond health benefits need to be stressed more. Finally, additional skills training is needed in how to form supportive social networks.

Study Limitations and Future research

There are a number of limitations in this model and the design and execution of this study.

The most important limitations of this model are the large number of variables and the two stage nature of the model. A model with fewer variables is certainly desireable both for conducting research and for setting practice priorities. The two stage nature of this model makes it impossible to test the full model through regression analysis, and with the current configuration through casual modeling methods. The model was created with full recognition of both these problems. The purpose of a model is to depict reality as we conceive it to be, not to conform with the convenience of parsimony or the requirements of statistical methods.

The design of this study did allow the corellational relationship of the variables to be tested, and it did provide the temporal sequence required to establish causality, but it did not test covariance of the variables. An interventional design would be required to establish that type of relationship.

Limitations in the execution of the study include the low response rate and the possible bias introduced by the high proportion of exercisers responding to the study. Neither of these problems impacts the ability of the study to test the model. If this were a study testing population prevalance, the response rate would not be acceptable. However, in testing a model, the most important factor is securing a sample that has sufficient variation in the values of the variables tested to test the model. The high variance explained by this model demonstrates the population is adaquate from this perspective.

The conclusions of this study must be further tempered by the fact that this is the first test of this new model, and future research related to this model should replicate this study to determine if the results can be repeated. Other research should test the model on other populations including lower income and less well educated and more racially diverse populations, as well as youth and seniors. Other research should measure the ability of the model to predict exercise using other measures of exercise, such as presence or absence, frequency and intensity, and type of exercise (Sallis & Hovell, 1990). Finally, the ability of the model to predict other health behaviors such as eating habits, smoking, and management of stress need to be conducted after behavior specific measures are developed.

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