VALIDITY OF THE HEALTH BELIEF MODEL AS A PREDICTOR OF ACTIVITY IN YOUNGER AND OLDER ADULTS

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The present investigation assessed Health Belief Model (HBM) variables and a measure of physical activity for both younger and older adults. Results of discriminant analyses suggest HBM variables and physical activity can predict age-group membership with 89% accuracy. The younger sample (n = 88; M = 21.5 years) was significantly more anxious about aging, perceived more barriers to exercise, less control from powerful others, and more social support than the older sample (n = 56; M = 71.8 years). For the younger sample, those who perceived more benefits of exercise, had social support, were male, and were less anxious about aging were more active. For the older sample, those who perceived more benefits of exercise were more likely to be active.

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CHAPTER I

INTRODUCTION

As the number of older persons continues to increase, the mental and physical health of older adults has become a major concern. One factor which has been identified in the facilitation of healthy older adults is physical activity or exercise. There is reason to believe that whereas objective aspects of health and feelings of well-being may be facilitated by exercise, the decision to initiate and maintain regular activity may in turn be influenced by the expectation as well as the attainment of these benefits (Dishman, 1988b). That is, the belief in the link between exercise and health needs to be internalized and the salience of a required increase in health-related behaviors must be perceived for individuals to begin and adhere to physical activity programs. In addition, beliefs concerning these benefits, as well as the potential costs, of regular exercise behavior may change with increasing age (Dishman, Sallis, & Orenstein, 1985). For example, the perception of a need to increase health-related behavior may become more relevant with increasing age. Therefore, the present study attempts to investigate the perceptions and modifying factors of health-related behaviors in younger and older adults as predicted by the Health Belief Model (Becker, 1974; Janz & Becker, 1984; Rosenstock, 1966, 1974).

The physical and psychological benefits associated with habitual exercise are well documented (e.g., Dishman, 1988a; Ostrow, 1980; Shephard, 1987) and it

appears that these effects can be extrapolated and applied to the older adult (e.g., Adams & deVries, 1973; Blumenthal, Emery, Madden, George, Coleman, Riddle, McKee, Reasoner, & Williams, 1989; Clarke, 1977; Howze, DiGilio, Bennett, & Smith, 1986; Sidney & Shephard, 1977). Physical improvements include positive changes in vital capacity, working heart rate, systolic and diastolic blood pressure, and percentage of body fat among individuals, regardless of age, who engage in regular and vigorous programs of physical activity (Ostrow, 1983). In addition exercise has been used in the treatment of coronary heart disease, hypertension, diabetes mellitus, osteoporosis, respiratory disease, low back pain, and obesity (Powell, 1988; Sallis & Hovell, 1990). Psychological improvements as the result of participating in regular physical activity include reductions in anxiety, depression, and tension as well as enhancement of self-concept and body image (Cureton, 1963; deVries & Adams, 1972; International Society of Sport Psychology, 1991; Olson, 1975; Powell, 1988; Sidney & Shephard, 1976). In addition, other researchers have suggested perceived psychological benefits rather than actual benefits may be a more salient result of exercise participation (Blumenthal et al., 1989; Emery & Blumenthal, 1990b; King, Taylor, Haskell, & DeBusk, 1989). For example, Blumenthal et al. (1989) reported few significant psychological changes could be attributed to aerobic exercise training, yet participants perceived themselves to be improving on a number of psychological and behavioral dimensions. Thus, although some diagnostic measures may fail to indicate positive psychological changes (for whatever reason, e.g., small samples, time constrained studies, etc.), individuals may still believe they are getting healthier and feeling better about themselves.

Yet, in spite of the accumulating evidence concerning the benefits associated with regular physical activity, research indicates that at any given time about 40%

of Americans do not exercise during leisure time and another 40% are active at levels probably too low and infrequent for fitness and health gains (Stephens, Jacobs, & White, 1985). Only 20% of Americans exercise regularly and intensely enough (Stephens et al., 1985) to meet current guidelines for fitness (American College of Sports Medicine, 1978) or to reduce risk for several chronic diseases and premature death (Paffenbarger, Hyde, Wing, & Hsieh, 1986; Powell, Spain, Christenson, & Mollenkamp, 1986). What is even more surprising is that of those individuals that begin a supervised exercise program, about 50% of them drop out of the program within six months to a year (Dishman, 1988c). In addition, consistent reports have surfaced indicating a declining involvement in physical activity with increasing age (Dishman et al., 1985; Gordon, Gaitz, & Scott, 1976; McPherson & Kozlik, 1979; Ostrow, 1980). A series of national health surveys suggest that only 10% to 19% of older Americans participate in vigorous physical activity (Teague, in press). Thus, there appears to be a need to not only identify the determinants of exercise behavior which will increase participation and adherence, but also a need to differentiate modifying factors which may change across the life-span.

In a review of the literature on known determinants of regular exercise and physical activity, Dishman et al. (1985) categorize these determinants into (a) characteristics of the person and his or her lifestyle habits (e.g., demographic factors, past or present health-related knowledge, perceived health, costs/benefits), (b) characteristics of environments (e.g., spouse support, perceived available time, access to facilities), and (c) characteristics of the activity itself (e.g., perceived intensity, perceived exertion, perceived discomfort). In addition, they differentiated the activities into supervised exercise programs (i.e., where activity can be directly observed) and spontaneous physical activity. While this excellent

review represents the accumulated knowledge-base on the determinants of physical activity and exercise, a theory-based representation is necessary to facilitate predictions about the relationships among the variables. One suggested model which incorporates psychological and social factors in the prediction of exercise participation and adherence is the Health Belief Model (HBM)(Becker, 1974; Janz & Becker, 1984; Rosenstock, 1966, 1974).

The HBM is an "value-expectancy" theory (Becker, 1974). The strength of the tendency for a behavior to occur is therefore a function of the expectation of a particular outcome as a result of the behavior. For example, decisions concerning exercise depend on how one values health and the expectation that exercise is related to a healthy existence. The HBM (Becker & Maiman, 1975; Knapp, 1988; Rosenstock, 1974; Rosenstock, Strecher, & Becker, 1988) states that readiness to undertake a regimen such as exercise depends upon:

(1) The existence of at least moderate health motivation to make health issues salient (e.g., concern about health or illness, willingness to accept direction).

(2) An evaluation of the illness threat (e.g., perceived vulnerability or susceptibility to or currently suffering from serious health problems).

(3) A belief in the potential or existing problem to be preventable or controllable (i.e., that exercise might yield physical and psychological remedial or preventative benefits) and a feeling of competence to implement the necessary change.

(4) Subjective estimates of the probability that compliance in an exercise program will reduce the threat, given certain "costs." Costs refer to perceived barriers that must be overcome in order to follow the exercise program (e.g., pain, inaccessibility, time constraints, expense).

(5) A factor that serves as a cue to trigger or elicit action and that makes the individual aware of his or her feelings about the health cueing condition. Cues might be internal (e.g., perception of bodily states) or external (e.g., interpersonal interactions or health propaganda).

Various other factors modify or enhance compliance, including demographic factors (e.g., age, sex, ethnicity), structural factors (e.g., cost, complexity, knowledge about disease), attitudes (e.g., satisfaction with regimen), interaction factors (e.g., mutuality of expectations and agreement between professional and client), and enabling factors (e.g., previous experience with regimen, social support) (Knapp, 1988). Figure 1 (Appendix C) portrays the Health Belief Model for predicting and explaining compliance behavior (adapted from Becker & Maiman, 1975, Figure 2 and Becker, Drachman, & Kirscht, 1974, Figure 2).

The HBM has been applied to predict patient compliance with medical regimens such as hypertension medication, dietary compliance, asthma, and pediatric medical regimens (Slenker, Price, Roberts, & Jurs, 1984). Specifically, perceptions of concern about the importance of health (i.e., health motivation) has been found to be positively correlated with preventive health behaviors (Harris & Guten, 1979; Ogionwo, 1973) and with compliance with medical regimens (Becker, Drachman, & Kirscht, 1972; Becker, Maiman, Kirscht, Haefner, & Drachman, 1977a). This suggests that an initial concern for good health is necessary for an individual to consider an exercise or physical activity program.

An individual's perceptions of personal susceptibility is related to a variety of health behaviors including immunizations (Cummings, Jette, Brock, & Haefner, 1979; Larson, Olsen, Cole, & Shortell, 1979), screening for Tay-Sach's disease (Becker, Kaback, Rosenstock, & Ruth, 1975), prophylactic dental visits (Kegeles, 1963), and screening for tuberculosis (Haefner & Kirscht, 1970; Hochbaum, 1958).

Thus, according to the HBM, in order for an individual to begin or maintain an exercise program, one must first believe that one is vulnerable or susceptible to health-related problems.

The probability of entering or remaining in an exercise program should also be influenced by a perception of the benefits of the specific activity. Several studies of health behavior have provided support for the influence of this factor (Becker et al., 1974; Becker, Nathanson, Drachman, & Kirscht, 1977b; Emery & Blumenthal, 1990a; Larson et al., 1979; Rosenstock, Derryberry, & Carringer, 1959; Walker, Pender, Frank-Stromborg, & Sechrist, 1990). For example, Becker et al. (1974), found that the belief in medication predicted regular administration of penicillin and a belief in doctors' ability to cure illness was related to keeping clinic appointments.

Although an individual may perceive potential benefits as the result of physical activity, barriers may still exist which may inhibit the initiation or maintenance of an exercise program. Some barriers which have been identified by researchers in reducing the threat of disease include monetary costs (Larson et al., 1979; Radius, Becker, Rosenstock, Drachman, Schuberth, & Teets, 1978), pain, inaccessibility or inconvenience (Becker et al., 1977b; Kegeles, 1963), doubts about the safety of the regimen (Becker et al., 1977a; Rundall & Wheeler, 1979), and complexity and duration of the regimen (Haefner & Kirscht, 1970; Haynes, Sackett, & Gibson, 1976). Eggers (1988) indicates that the reasons for not getting involved in a fitness program may not be formal obstacles, but existing attitudes such as the idea that individuals receive enough exercise in their everyday life, entering a program was too inconvenient, or that they were too tired to exercise. Whatever the reason, potential barriers to exercise exist and the ability to ignore or overcome

them may depend on whether or not the individual perceives personal control over the barriers.

Health locus of control has been frequently incorporated in the HBM and studies of health behavior (e.g., Noland & Feldman, 1985; Oldridge & Streiner, 1990; Rosenstock et al., 1988; Slenker et al., 1984; Sonstroem & Walker, 1973). According to the theory developed by Wallston and colleagues (Wallston, Wallston, & DeVellis, 1978; Wallston, Wallston, Kaplan, & Maides, 1976), individuals who believe they are in control of their health through their behaviors are termed "internals"; conversely, individuals who believe they are victims of illness and unable to affect health through personal actions are termed "externals." The external dimension has been separated into "powerful others" and "chance," indicating that one's behavior can be perceived to be the result of influence from powerful others or the result of chance, luck, or fate and is therefore beyond the individual's control (Wallston et al., 1978). Thus, it seems plausible that individuals who perceive self-control of health improvement may be more likely to be involved in physical activity than those who perceive external controls dictating their behavior.

One additional factor which has been investigated as a predictor of health-related behavior is cues which serve to trigger or elicit action (Rosenstock, 1974). Such cues might be internal sensations (e.g., perceptions of bodily states, anxiety) or external events (e.g., mass media propaganda, advice from friends or family). Such factors as the use of mass media (Becker et al., 1975; Hochbaum, 1958), appointment postcard reminders from the dentist (Larson et al., 1979), and the presence of symptoms (Haynes et al., 1976; Kirscht, Becker, & Eveland, 1976) have been shown to influence people to take a recommended health action.

Several studies have incorporated HBM predictor variables in physical activity or exercise settings. Olson and Zanna (1982) found that male adherers at an exercise center believed themselves more susceptible to heart, respiratory, and obesity problems than non-adherers. Noland and Feldman (1985) and Sonstroem and Walker (1973) demonstrated that persons with an internal locus of control believed that exercise was under their control and therefore participated more frequently in and had more favorable attitudes toward physical activity. Externals, by contrast, attributed exercise to be out of their control, due to chance, luck, or powerful others and subsequently enjoyed physical activity less and participated less frequently. Slenker et al. (1984) found the HBM accounted for 61% of the variance in jogging behavior (40% of the variance was due to barriers to action such as lack of time, job or family responsibilities, or weather constraints). Oldridge & Streiner (1990) indicated the HBM predicted prescribed exercise compliers and dropouts in cardiac rehabilitation 64% of the time (explaining only 5% of the variance). Demographics, health behavior, and HBM factors accounted for 21% of the variance with group membership correctly predicted 74% of the time; avoidable and unavoidable dropout was correctly predicted 84% of the time with 57% of the variance explained.

Unfortunately, the accumulated knowledge of the determinants of physical activity has been primarily restricted to younger and middle-aged adults. A few notable exceptions would include Sharpe and Connell's (1992) investigation of employees aged 50 to 69 who participated in a university-supported health promotion program. Older workers who believed they could initiate or continue a vigorous exercise program, that vigorous exercise would result in desirable health benefits, and that few barriers to regular exercise existed were more likely to express intention to exercise regularly during the subsequent 6 months. Emery and

Blumenthal (1990a) also reported that health enhancement was the most common reason given for continued exercise (one year later) in an aerobic exercise program for older adults aged 60 to 83. In addition, Howze et al. (1986) reported that high attenders in an exercise program had more favorable expectations of the benefits of exercise and perceived fewer barriers to future exercising than low attenders (mean age was 63). And, Andersson and Stanich (1992) found that 36% of an elderly sample aged 65-74 in Stockholm reported cues to action which led to both positive and negative behaviors.

Although research to date has yet to compare multivariate HBM predictors for younger and older adults simultaneously, age has been reported to be both positively related to adherence (Kasl, 1974; Ward & Morgan, 1984) and participation (Heitmann, 1986), as well as negatively related to dropout (Oldridge & Streiner, 1990), attendance (Howze et al., 1986), jogging frequency (Slenker et al., 1984), and participation (Shephard, 1987). Therefore, to clarify the equivocation, as well as validate the model for older adults, it seems imperative that an investigation of the HBM's predictors be conducted with younger and older adults concurrently.

Researchers (e.g., Carter, Elward, Malmgren, Martin, & Larson, 1991; Dishman et al., 1985) also note that the determinants associated with physical activity and exercise for older adults are likely to differ from their younger counterparts. For example, the perceived barriers to exercise, motives for exercise, perceived vulnerability to disease, cues which trigger action to exercise, or a general anxiety towards aging may be very different for older adults than younger adults. For instance, Walker et al. (1990) found that the perceived benefits of/barriers to exercise, one's definition of health, gender, preferred level of exertion, and health locus of control accounted for 34.5% of the variance of

exercise in middle-aged and older adults, but no attempt was made to identify the benefits/barriers specific to younger versus older adults. A perusal of the literature incorporating age as a predictor of physical activity is indeed equivocal due to the lack of researchers comparing middle-aged and older adults' perceptions of health beliefs and physical activity simultaneously.

Unfortunately, because most of the extant literature incorporating the HBM has been limited to investigations of younger and middle-aged adults, little is known about the validity of HBM assessment instruments for elderly populations. Critics of the HBM (e.g., Maiman, Becker, Kirscht, Haefner, & Drachman, 1977) suggest that many of the constructs have been poorly operationalized (i.e., the scales utilized to tap the constructs lack reliability). In light of the dearth of participation and adherence research with older adults this reliability/validity issue is especially salient as it applies to aged populations. Thus, if the HBM is to be used to predict behavior for younger and older adults, it is critical to determine if the model is to be universally or differentially applied across the life-span.

Therefore, the first purpose of the present study was to employ the Health Belief Model in examining the extent to which younger and older adults similarly (1) perceive susceptibility/risk to aging and/or disease, (2) anticipate positive benefits perceived to be associated with regular exercise, (3) perceive barriers to exercise, (4) perceive health behavior to be under one's own control, (5) identify significant others as sources of support for, or as perceived barometers of, regular exercise, and (6) identify cues to action (i.e., factors precipitating an awareness of the need for regular exercise).

The second purpose of the present investigation was to examine the ability of the HBM to predict physical activity. According to the general predictions of the HBM, it was hypothesized that both younger and older adults would be more likely

to report having participated in various activities at least once in the past year if they perceived (1) themselves to be more susceptible to health-related problems, (2) more benefits of physical activity, (3) fewer barriers to participate in physical activity, (4) health behavior to be under one's own control, rather than dependent upon external factors, (5) more significant others influencing exercise and health habits, and (6) more cues to action.

CHAPTER II

METHODS

Subjects and Procedures

Data were collected from 144 subjects. Subjects were differentiated into younger (less than 32 yr) and older (greater than 59 yr) samples. Therefore, 88 college students (M age = 21.5, SD = 2.4) of which 56 were female and 56 community-residing older adults (M age = 71.8, SD = 6.4) of which 38 were female were included in the data analyses. Recruitment was conducted through local media advertising, promotional fliers, direct mailing, and announcements to local fitness clubs as well as aging organizations and senior citizen centers in a major metropolis (urban and rural areas) of the Southwestern United States. Informed consent was obtained and subjects were told they would receive a ten dollar payment for completing a short questionnaire regarding their opinions about regular exercise. This took place in the individual's home or on a university campus (on an individual basis, i.e., not in a group setting) and each questionnaire required approximately 45 min to complete.

Measures

A survey instrument was developed which incorporates the following factors of the HBM: 1) Perceived susceptibility to serious health problems, 2) Expected benefits of exercise, 3) Perceived barriers to exercise, 4) Health locus of control, 5) Significant others in support of exercise, 6) Cues to action, and 7) Personal

anxiety about aging (an additional factor precipitating an awareness of the need for regular exercise). Other assessments included demographic variables (age, sex, height, weight, occupation, and years of education), health history, and the frequency and duration of physical activities participated in over the past 12 months (see Appendix A for complete questionnaire).

Exercise Perceptions. The Exercise Perception Questionnaire was developed from a perusal of the extant literature and based on five of the seven previously mentioned predictors (health locus of control and anxiety about aging were assessed through additional questionnaires) included in the HBM (see Figure 1, Appendix C):

1) Perceived susceptibility to serious health problems: Sixteen diseases or negatively perceived health problems including depression, obesity, stroke, and inactivity. Each item consists of a statement requiring the respondent to rate his or her degree of agreement on a 5-point Likert-type scale ranging from 1 (Somewhat High Risk) to 5 (Extremely Low Risk).

2) Expected benefits of exercise: Thirteen stated potentially positive outcomes associated with exercise including such items as losing weight, feeling better psychologically, getting stronger, being with friends/social, and release of tension. A 5-point Likert-type scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree).

3) Barriers to exercise: Seventeen stated reasons for not exercising including such items as not enough time, inconvenience, injury, cost, and bad weather. A 5-point Likert-type scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree).

4) Significant others in support of exercise: Eleven potential sources of inspiration or support regarding exercise including spouse, parent(s),

children, physician, co-workers, and instructors. A 5-point Likert-type scale ranging from 1 (Extremely Influenced) to 5 (Not Influenced At All).

5) Cues to action: Twelve potential factors which may bring about an awareness of the need to exercise leading to action including such reasons as a Doctor's recommendation, advice from friends, shortness of breath, newspaper/magazine article, and availability of exercise program. A 5-point Likert-type scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree).

Multidimensional Health Locus of Control Scale. The Multidimensional Health Locus of Control Scale (Form A; Wallston et al., 1978) is an 18-item questionnaire which assesses an individual's expectancies about control over their health (the fourth of the seven HBM factors noted above) on three dimensions: internal, powerful other, and chance. The Internality scale measures the extent to which one believes one's behavior determines one's health. The Chance and Powerful Others scales reflect the degree to which one believes health is determined by unpredictable factors (i.e., luck or fate) or by the actions of others (i.e., health-care professionals), respectively. This instrument contains six items for each subscale and each item consists of a statement requiring the respondent to rate his or her degree of agreement on a 5-point Likert-type scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree). The scale has been tested in varied populations with acceptable alpha reliabilities ranging from .67 to .77 (Wallston et al., 1978).

Aging Opinion Survey: Personal Anxiety Toward Aging. The Aging Opinion Survey (Scale Two; Kafer, Rakowski, Lachman, & Hickey, 1980) is a 15-item questionnaire reflecting anxiety, uneasiness, fear, or dread concerning one's aging (the seventh of the seven HBM factors noted above). The instrument requires the respondent to rate his or her degree of agreement on a 5-point

Likert-type scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree). The scale has an acceptable alpha reliability coefficient of .65 (Kafer et al., 1980).

Health History. A series of questions were developed to tap specific health-related areas. These include sections focusing on the number of years smoking cigarettes, time spent at home (or in the hospital) due to illness, frequency of becoming ill (e.g., less than 2 times/year, 3-6 times/year), generalized perception of present health (compared to five years ago), and a list of ten potential illness or physical problems which the respondent is to check if having experienced (e.g., chest pains, obesity, heart problems, high cholesterol, and broken bones). One additional open-ended question asks the individual to identify his or her worst health problem.

Activity. A questionnaire was developed which required the respondent to indicate the number of months and days per week (frequency) as well as minutes per day (duration) spent participating in twenty specific physical activities (plus an "other" category) or sports during the past 12 months. The activities listed include individual sports such as jogging, weight training, walking, and golf as well as team sports such as softball, baseball, basketball, and soccer. The eventual measure of activity utilized was the number of activities the individual participated in at least once during the previous year (Brown & Frankel, 1993). This measure of activity was utilized because it is more likely for the subject to accurately recall at least one instance of participation in 21 activities during the previous year than it is to recall the exact number of minutes per day, days per week, and months per year for each activity.

CHAPTER III

RESULTS

Instrument Reliabilities

Internal consistency estimates for the new HBM scales were quite good. Most were close to or above .80, which is the minimum level recommended for applied purposes (Nunnally, 1978). The alphas for the five factors, for the younger and older samples, respectively, were: Susceptibility to Health Problems = .88 and .92, Benefits of Exercise = .90 and .87, Barriers to Exercise = .81 and .79, Social Support from Others = .77 and .85, and Cues to Action = .87 and .88.

The internal consistency (coefficient alpha) estimates for the established scales were generally higher than previously reported. For the Multidimensional Health Locus of Control Scale (Form A; Wallston et al., 1978), the alphas for each subscale, for the younger and older samples, respectively, were: Internality = .84 and .85, Powerful others = .74 and .71, and Chance = .71 and .80. For the Aging Opinion Survey (Scale Two; Kafer et al., 1980), the alphas for the younger and older samples, respectively, were .73 and .71.

HBM Differences Between Younger and Older Adults

Results of a one-way ANOVA with 11 dependent measures indicated a significant difference, $F(11, 130) = 15.62$, $p < .001$, in the extent to which younger and older adults similarly perceive various HBM variables (each variable was defined by the sum of its items) as well as the extent to which they are active

(see Table 1, Appendix B). Due to the sizable difference in the number of activities engaged in by the younger ($\underline{M}$ = 5.6) and older ($\underline{M}$ = 2.1) groups at least once the prior year, two discriminant analyses were conducted to identify the dimensions along which the groups differ. Discriminant Analyses utilizing this method of activity assessment produced more accurate age-group membership classification than any other method attempted (e.g., multiplying the frequency by duration data to identify the total number of minutes participating in physical activity over the entire year). In addition, more variance was accounted for when predicting activity via Multiple Regression analyses by this method than through any other method of quantifying activity.

The first discriminant analysis, with age as the classifying variable, included activity as a predictor variable and yielded a significant discriminant function (χ^2_8 = 118.02, $\underline{p} < .001$) defined in terms of the linear combination of the following predictors: (1) activity (having the highest value on the selection criterion which was the minimization of Wilks lambda; $\lambda = .71$, $\underline{p} < .001$; $\underline{s} = .56$), (2) anxiety about aging ($\lambda = .63$, $\underline{p} < .001$; $\underline{s} = .32$), (3) powerful others external locus of control ($\lambda = .55$, $\underline{p} < .001$; $\underline{s} = -.29$), (4) barriers to exercise ($\lambda = .52$, $\underline{p} < .001$; $\underline{s} = .31$), (5) susceptibility to health problems ($\lambda = .48$, $\underline{p} < .001$; $\underline{s} = -.13$), (6) benefits of exercise ($\lambda = .45$, $\underline{p} < .001$; $\underline{s} = .07$), (7) social support from significant others ($\lambda = .44$, $\underline{p} < .001$; $\underline{s} = .27$), and (8) chance external locus of control ($\lambda = .43$, $\underline{p} < .001$; $\underline{s} = -.06$). The resulting meaningful structure coefficients ($\underline{s} \geq .30$; Pedhazur, 1982, p. 704), which represent the correlation between an individual variable and the vector composite scores obtained by applying the regression equation to subjects' scores on the independent variable, when squared, revealed being active alone represents 31% of the variance accounted for by the discriminant function with anxiety and barriers accounting for 11% and 10%, respectively. The

squared structural coefficients representing influence from powerful others and social support approached meaningful values, accounting for 8% and 7%, respectively. Inspection of the descriptive statistics and univariate tests (see Table 1, Appendix B) supports these findings, suggesting the younger sample is more active and they report greater anxiety about aging, more barriers to exercise, less control from powerful others, and more social support than the older sample.

In contrast to the preceding analysis which included activity as a predictor variable, a second discriminant analysis was conducted excluding activity and yielding a significant discriminant function ($\chi^2_7 = 76.62$, $p < .001$) defined in terms of the linear combination of the following variables: (1) anxiety about aging ($\lambda = .88$, $p < .001$; $s = .43$), (2) powerful others external locus of control ($\lambda = .76$, $p < .001$; $s = -.39$), (3) social support ($\lambda = .67$, $p < .001$; $s = .35$), (4) susceptibility to health problems ($\lambda = .62$, $p < .001$; $s = -.17$), (5) barriers to exercise ($\lambda = .58$, $p < .001$; $s = .41$), (6) internal locus of control ($\lambda = .58$, $p < .001$; $s = .04$), and (7) benefits of exercise ($\lambda = .57$, $p < .001$; $s = .10$). The resulting meaningful structure coefficients, when squared, revealed anxiety about aging accounts for 18% of the variance of the discriminant function with barriers, influence from powerful others, and social support accounting for 17%, 15%, and 12%, respectively. Inspection of the descriptive statistics and univariate tests (see Table 1, Appendix B) again supports these findings suggesting the younger sample reported greater anxiety about aging, more barriers to exercise, less control from powerful others, and more social support than the older sample.

When the variables identified by the HBM are incorporated (i.e., excluding activity), 85% of the subjects were correctly classified to groups based on age, with 89% of the younger sample and 79% of the older sample being correctly classified. In contrast, when a measure of physical activity participation is included in the

analysis along with the same HBM variables, 89% of the subjects can be correctly classified, with 92% of the younger sample and 84% of the older sample being correctly classified.

In summary, the two discriminant analyses suggest two similar classification schemes for predicting younger versus older group membership. Although the variables identified by the HBM which seem to pertain to the younger, relative to the older, sample included greater anxiety about aging, more perceived barriers to exercise, less perceived control from powerful others, and more social support, the factor which accounted for the greatest percentage of the variance was activity. In addition, with activity included in the analysis overall subject classification increased four percent and classification of the younger and older samples separately increased three and five percent, respectively.

Activity As Predicted by the HBM

Bivariate correlations between each of the predictor variables and a measure of physical activity (see Tables 2 and 3, Appendix B) indicate the highest value for the younger sample to be .57 (average r = .17) and for the older sample .45 (average r = .17), therefore multicolinearity seems not to be a major issue. Subsequent forward-entry multiple regression analyses, utilizing HBM variables to predict activity level, for the younger and older samples separately as well as combined, were conducted. Results suggested that when the younger and older samples were combined, age, social support, sex, benefits of exercise, and barriers to exercise significantly ($p < .001$) predicted activity. In contrast, when the younger and older samples were analyzed separately, benefits of exercise, social support, sex, and anxiety about aging predicted activity significantly ($p < .001$) for the younger sample and benefits of exercise significantly ($p < .05$) predicted activity in the older sample (see Table 4, Appendix B).

In summary, results of the combined-sample multiple regression indicates that levels of activity were higher for those who were younger, had an established social support network, were male, and perceived more benefits of and less barriers to exercise. In contrast, when the sample was separated into younger and older adults, activity was higher for the younger adults if they perceived more benefits of exercise, had an established social support network, were male, and were less anxious about aging. For the older sample, higher levels of activity were associated with more perceived benefits of exercise.

CHAPTER IV

DISCUSSION

Instrument Development

The present study investigated the perceptions and modifying factors of physical activity in younger and older adults as predicted by the Health Belief Model (Becker, 1974; Janz & Becker, 1984; Rosenstock, 1966, 1974). The initial purpose was to examine the extent to which younger and older adults similarly perceive various aspects of the HBM. As part of this purpose, reliable instruments (for both younger and older adults) were developed for the assessment of HBM variables such as the susceptibility or risk of health problems, the benefits of and barriers to exercise, the cues to action (i.e., factors precipitating an awareness of the need for regular exercise), and the sources of social support which serve as perceived barometers of regular exercise.

Prediction of Age-Group Membership

Results of the second Discriminant Analysis (without activity as a predictor) suggest age-group membership can be predicted with the knowledge of HBM factors such as anxiety about aging (perhaps an internal cue to action), susceptibility to health problems, the benefits of and barriers to exercise, an established social support network, and contrary to expected, an internal or external locus of control. Indeed, 85% of these subjects were correctly classified into younger and older age groups based on these factors. But the single best predictor of age-group was

whether or not the individual was active. Being active accounted for 31% of the age-group membership prediction variance in the first Discriminant Analysis and adding activity as a predictor increased the number of correctly classified subjects to 89% of the time, relative to the Discriminant Analysis without activity as a predictor where 85% were correctly classified.

HBM Perceptions

Results of the ANOVA and subsequent discriminant analyses also support the belief that younger and older adults perceive some aspects of the HBM differently, while perceiving other aspects similarly. The squared structural coefficients and univariate tests suggest the younger sample was more anxious about aging (e.g., being more anxious about the future the older one gets, the thought of outliving one's spouse is frightening), perceived more barriers to exercise (e.g., not enough time, cost, interferes with work), perceived less control over their lives from powerful others (e.g., doctors, nurses), and more social support influencing their exercise and health habits (e.g., parents, siblings, friends).

In contrast, the younger and older samples were both relatively healthy (compared to five years ago), perceived the benefits of exercise similarly to be quite high (e.g., getting stronger, increasing physical conditioning, improved health), and the susceptibility to serious health problems (e.g., obesity, stroke, memory loss) and the cues to action (e.g., TV advertisements, illness of friends, difficulty in doing daily chores) to be relatively low or not relevant. In addition, both reported similarly high levels of internal locus of health-related control (e.g., in control of health when sick, can avoid illness by taking care of self) and a relatively low level of chance-related external control (e.g., good health is a matter of good fortune, most things that affect health happen by accident). Therefore, it seems that younger and older adults do perceive both similar and differing aspects

of the HBM. This conclusion is especially relevant in relation to the results of the regression analyses.

Predicting Activity

The multiple regression analysis, with the younger and older samples combined, suggests activity level can be predicted based on age, social support, sex, and the benefits of and barriers to exercise. Specifically, those who were younger, had an established social support network, were male, and perceived more benefits of and less barriers to exercise were more likely to be active. These results tend to support Dishman et al.'s (1985) categorization of the determinants of regular exercise and physical activity. Characteristics of the person and his or her lifestyle are represented by the age, sex, and benefits/barriers factors. The social support network and the barriers variables would qualify as characteristics of the environment. And characteristics of the activity could be accounted for if the weather conditions or poor facilities/equipment are included as barriers.

In contrast, the multiple regression analyses with the younger and older samples separated, revealed surprising results. For the younger sample, the benefits of exercise, social support, sex, and anxiety about aging were significant predictors. Specifically, those who perceived more benefits of exercise, had an established social support network, were male, and were less anxious about aging, were more likely to be active . Thus, when compared to the above combined regression analysis, the barriers to exercise drop out and anxiety about aging enters in when only the younger adults were included in the regression. Although the younger sample perceived more barriers ($\underline{M} = 41.5$) than the older sample ($\underline{M} = 32.5$), the extent of barriers perceived is no longer predictive of activity. It seems that younger adults will be active (at least relative to the older adult) regardless of the number of perceived barriers which exist. In addition, anxiety about aging is a

significant predictor of activity for the younger adult, but it is a negative association. This suggests that activity serves to lessen anxiety about aging. Although this may appear to be contrary to the predictions of the HBM, it can be explained by the fact that these subjects were already active and relatively healthy. According to the HBM (e.g., Becker et al., 1977a; Becker et al., 1975), in order for an individual to begin an exercise program, one must first believe that one is vulnerable or susceptible to health-related problems (a construct which in this case was significantly correlated with anxiety about aging; see Tables 3 and 4, Appendix B). This relationship may not hold for individuals who are already active. That is, risk to poor health may predict who will enter an exercise regime but not who will maintain one. Once involved in a regular exercise routine, the perception of susceptibility to poor health or anxiety about the aging process becomes less relevant.

Unfortunately, at least in terms of the predictive power of the HBM, only the benefits of exercise significantly predicted activity for the older sample. These results may suggest that the HBM does not apply equally well to an older population. However, it may be that the determinants associated with physical activity and exercise for older adults do differ from that of their younger counterparts (e.g., Carter et al., 1991; Dishman et al., 1985) and our task is to identify these differences. Specifically, future investigations should include other factors which have been identified as variables that may determine the probability of exercise such as past exercise experience, self-efficacy for exercise, self-motivation, behavioral skills, and potential reinforcements (Dishman et al., 1985). Due to the limited utilization of multiple HBM factors in research involving physical activity, it seems too early to make any conclusions concerning its validity as a predictive model for older adults.

Limitations of the Study and Explanations for Nonsignificant Findings

One possible explanation for the lack of multiple predictors for the older sample involves their limited range of physical activity participation. The measure of activity utilized, when recoded to permit a frequency count of the activities engaged in at least once during the previous 12 months (with a maximum of 21), produced a mean for the older sample of 2.06 (SD = 1.25) and a range from 0 to 5 (compared to the younger sample: M = 5.60, SD = 3.30, range = 1 to 15). This measure of activity was utilized because it was more likely that subjects would accurately recall at least one instance of participation in 21 activities during the previous year than it was to recall the exact number of minutes per day, days per week, and months per year of participation for each activity (Brown & Frankel, 1993. Although this measure of activity produced the best degree of differentiation between the younger and older samples on the various HBM factors, as well as facilitating the highest correct classification percentages in the Discriminant Analyses, there may not have been enough variability among the older sample to facilitate a significant regression. Other methods for assessing the amount of physical activity participation, such as multiplying the frequency by duration data to identify the total number of minutes participating in physical activity over the entire year, failed to produce more robust results.

There are several possible explanations for this limited range of physical activity for the older sample in comparison to the younger sample. First, it may be a cohort effect concerning differing expectations about health and physical activity. Although it is considered normal for today's generation of younger adults to associate intense physical activity with being "healthy," for older adults healthy may be better defined in terms of one's ability to be mobile, to be relatively free of injuries, illness, or aches and pains, and an overall feeling of well-being. More

passive activities may be considered the norm for healthy older adults (Gordon et al., 1976). Having the ability to drive, to attend social functions like card games, sewing or gardening clubs, or work around the house may represent healthy daily activities more than running, softball, basketball, skiing, or weight training might for the younger adult. For example, our older subjects identified several "other" activities they participated in during the previous year such as gardening/mowing the lawn, stretching, cleaning the apartment, or horseback riding.

Another possible explanation for the limited level of activity for the older adults in the present investigation is the individual's place of residence. Cattle and Lyles (1992) reported a high frequency and diversity of activity for older adults, but their sample consisted of women who resided either in a retirement community or an urban setting. The present older sample included both males and females and no assessment was made to identify their residence. It may be that the peer influences in operation for women, especially women living in a retirement community, promote greater emphasis on physical activity than were evident in the present sample. Residents of retirement communities often incorporate physical activities such as golf, tennis, swimming, or walking into their daily social routines because these activities are provided as part of the purchase price of a home. This would tend to produce potentially greater external motivation (i.e., peer pressure and social reinforcements) as well as fostering a potentially greater intrinsic motivation (i.e., via modeling or self-referencing processes) to be active.

A final limitation of the present study which may be related to the failure to predict activity by more of the HBM variables (than just the benefits of exercise) is the relatively small sample size for the older sample ($\underline{n} = 56$). It is possible that a larger sample, with the concurrent increase in statistical power, might have produced a significant regression equation which included several HBM factors.

Of additional interest are the HBM variables which failed as predictors of physical activity in any of the regression analyses. Specifically, contrary to the hypothesized relationship, cues to action, susceptibility to poor health, an internal locus of control, and the assessment of present health (in relation to five years ago) were not included in any significant multiple regression.

First, the measure developed for the cues to action, although of sufficient internal consistency (alpha = .87 for the combined sample), seems to be biased in favor of external cues. That is, 8 of the 12 items refer to external influences such as advice from others, illness of others, Doctor's recommendation, advertisements on TV, etc. In comparison, the four items which appear to tap internal perceptions are difficulty in climbing stairs, not fitting into clothes comfortably, difficulty in doing daily chores, and shortness of breath. Due to the nature of this particular sample (i.e., both the younger and older subjects were relatively high on internal locus of control), it is not too surprising that this measure which is primarily assessing external cues to action failed to adequately assess enough cues to action to include it as a significant predictor variable.

Susceptibility to poor health was also not predictive of activity. As discussed above, these subjects were relatively healthy and somewhat active (at least the younger sample was). It may be that susceptibility to poor health is a better predictor only for relatively unhealthy and inactive individuals. That is, risk of illness may predict the onset of activity, but not its maintenance. Becker et al. (1972) found that mothers that were less likely to adhere to a medical regime for their children saw their children as relatively healthy and likely to remain so. As a consequence, these women felt no need to undertake special activities to maintain their child's health. Similarly, once an individual is active, he or she may perceive the risks of poor health decreasing as a perception of good health increases. Thus,

susceptibility to poor health for relatively healthy individuals may not be predictive of physical activity.

Contrary to as hypothesized, locus of health control also failed to predict physical activity level. According to the HBM predictions, a positive relationship should exist between an internal locus of health control and health behavior. In addition, a negative relationship should exist between an external locus of health control and health behavior. In the present investigation, neither relationship was found. Although both the younger and older samples were highly internal and the older sample was also high on the powerful others dimension of external control, none of these predicted physical activity participation. While this is somewhat puzzling, it may be due to the utilization of the Multidimensional Health Locus of Control Scale (MHLC; Form A; Wallston et al., 1978). Although it has been shown to relate to various health behaviors (see Wallston et al., 1976 for a review), it may not predict physical activity or exercise very well. Specifically, the MHLC refers to "getting sick" or "illness" as perceptions of poor health. It may be that a physical activity or exercise-specific locus of control form is required which represents good/poor health in terms of physical conditioning, flexibility, strength, tension reduction, etc. Perhaps this would produce a better predictor of physical activity.

And finally, perceived health was not a predictor of activity. The question, which compared the subject's present health to five years ago on a 3-point scale (i.e., better than, the same, or worse than), may not have been the best measure of the individual's general concern about health (a factor indicated in the HBM, see Figure 1, Appendix C). These subjects perceived themselves to be in relatively the same general health as compared to five years ago. Perceiving yourself to be in the same general health as five years ago may or may not mean the perception is that

you are healthy. If you were relatively unhealthy five years ago, being in the same general health today would indicate your are still relatively unhealthy.

Additional questions which might have tapped this factor could have been phrased in behavioral terms identifying tasks which one is either unable to do, still able to do, or better at than 1, 5, or even 10 years ago. For example, tasks such as walking a mile, carrying a suitcase through the airport, climbing a flight of stairs, or jogging around the block might qualify. Possibly more importantly, the questions should assess the individual's concern about these abilities. In other words, the questions should ask if the subject is concerned about an inability to perform said tasks, or does it not bother them. If concern about inabilities to perform at previous competence levels exists, it should follow that the individual will be motivated to overcome these performance deficits. For a measure of perceived health to be a predictor of activity, it needs to incorporate a motivational component.

Future Directions

The results and limitations of the present investigation suggest a number of recommendations for future research. First, due to the lack of multiple significant predictors of physical activity for the older sample, future investigations should include a qualitative assessment of each predictor variable. That is, we should be asking older adults what would make them more active, what they perceive the benefits of and barriers to exercise to be, what specific cues influence their decision to participate in physical activities, and what constitutes a physical activity to them, in their own words.

Second, future research must take into account cohort effects. For example, it would be interesting to replicate the present study 30 years from now. The socialization processes and internalization of beliefs and values consistently change.

To be able to employ the HBM across the life-span, it will be necessary to evaluate the existing belief systems in operation as well as the resulting behavioral patterns to determine what constitutes the definition of being "healthy" and being "active" for each generation of older adults. For example, it will be interesting to assess today's younger active adult cohort when they become tomorrow's older adult cohort. Will they continue to be active throughout their life-span?

Third, more emphasis needs to be placed on the social context influencing the behavioral patterns of older adults. The influence of retirement communities, social organizations, country clubs, and other such group-structured living and sporting organizations needs to be assessed when examining the reasons why older adults become or stay active. If these influences are substantial, the goal for health educators becomes one of fostering their development and encouraging individuals to join them or move, if possible, into retirement communities.

Fourth, subsequent utilization of the cues-to-action subscale should incorporate additional internally-referenced factors which facilitate the adoption of health-related activities. A better balance would incorporate eight stated cues which are internally-referenced and eight which are externally-referenced.

Fifth, a physical activity or exercise-specific locus of control questionnaire needs to be developed to assess the internal and external forces which are active in the decision to pursue physical activities. The statements should reflect a concern over improving conditioning, strength, endurance, and flexibility, rather than on being ill or getting sick.

Sixth, a better method for assessing one's general concern about health should be developed. In order to better ascertain one's motivation to be healthy, it seems necessary to first identify how healthy the individual perceives him or herself to be, then determine how motivated they are to improve their health. Although it is well

known that intentions are poor predictors of behavior, a concern about improving one's health should at least add to the predictive power of the HBM.

And finally, future research, possibly prospective in design, will be necessary to resolve the issue of predicting activity for healthy versus unhealthy adults. The ideal investigation would be to assess a sample of younger and older adults who are both in relatively poor health prior to entrance in an exercise program, then assess them after a period of time (e.g., one year) and compare the predictive power of the HBM prior to entrance as well as the impact on health beliefs as one becomes more healthy (assuming that is the result of the program). Thus, the ability of the HBM to predict the onset and maintenance of activity could be measured.

Conclusion

In conclusion, the present investigation revealed the HBM variables can accurately predict age-group membership and that the younger adults were more anxious about aging, perceived more barriers to exercise, perceived less control from powerful others, and perceived more social support than the older adults. In addition, all subjects perceived high benefits of exercise, were primarily controlled by internal factors, and believed themselves to be at low risk for health problems.

Some of these beliefs are associated with participation in physical activity. Physical activity was significantly predicted for those who were younger, had social support in their exercise habits, were male, and perceived more benefits of and less barriers to exercise. And whereas the benefits of exercise are well established (Dishman, 1988a; Ostrow, 1980; Shephard, 1987) and the link between the belief in these benefits and actual participation rates seems to have merit for increasing participation (Blumenthal et al., 1989; Emery & Blumental, 1990b; King et al., 1989), it is still too soon to state categorically which variables mediate or modify the process. This is especially true for older adults. Thus, while the HBM, in

theory, should apply equally as well to younger and older adults, further research is required to identify predictor variables and validate the model for older adults.

The better we are at promoting the benefits of exercise within a program that meets the social needs of our young adults the more likely we are to create an internalized belief in the value of physical activity and exercise and the more likely we are to produce a healthy population in the future. Today's young active adult should become tomorrow's active older adult.

APPENDIX A

QUESTIONNAIRES

To what extent do you feel that you are personally at risk to develop or experience each of the following. Please use the following scale and circle your answer.

1 = Extremely high risk
2 = Moderately high risk
3 = Somewhat high risk
4 = A little risk
5 = Extremely low risk

		Somewhat High Risk				Extremely Low Risk
		1	2	3	4	5
a.	Depression	1	2	3	4	5
b.	Osteoporosis	1	2	3	4	5
c.	Obesity	1	2	3	4	5
d.	High blood pressure	1	2	3	4	5
e.	Heart attack	1	2	3	4	5
f.	Stroke	1	2	3	4	5
g.	Memory loss	1	2	3	4	5
h.	Bouts of anxiety	1	2	3	4	5
i.	Dementia	1	2	3	4	5
j.	Inactivity	1	2	3	4	5
k.	Arthritis	1	2	3	4	5
l.	Stiffness and soreness	1	2	3	4	5
m.	Cancer	1	2	3	4	5
n.	Diabetes	1	2	3	4	5
o.	Lack of strength	1	2	3	4	5
p.	Overweight	1	2	3	4	5

Exercise Perception Questionnaire

Please indicate how much you agree or disagree with the following statements. Please use the following scale and circle your answer.

1 = Strongly agree
2 = Somewhat agree
3 = No opinion
4 = Somewhat disagree
5 = Strongly disagree

		Strongly Agree				Strongly Disagree
		1	2	3	4	5
A major reason when I do not exercise is....						
a.	Not enough time	1	2	3	4	5
b.	Inconvenience	1	2	3	4	5
c.	Lack of transportation	1	2	3	4	5
d.	Injury	1	2	3	4	5
e.	Poor physical conditioning	1	2	3	4	5
f.	Exercise is boring	1	2	3	4	5
g.	Lack of facilities	1	2	3	4	5
h.	Cost	1	2	3	4	5
i.	Exercise interferes with work	1	2	3	4	5
j.	Exercise interferes with social/	1	2	3	4	5
	family activities	1	2	3	4	5
k.	Lack of motivation	1	2	3	4	5
l.	Disapproval by others	1	2	3	4	5
m.	Too tired	1	2	3	4	5
n.	Too lazy	1	2	3	4	5
o.	Illness	1	2	3	4	5
p.	Limiting health reason	1	2	3	4	5
q.	Bad weather	1	2	3	4	5

		Strongly Agree				Strongly Disagree
		1	2	3	4	5
A major benefit of physical activity for me is to....						
a.	Losing weight					
b.	Feeling better psychologically	1	2	3	4	5
c.	Getting stronger	1	2	3	4	5
d.	Increasing range of motion	1	2	3	4	5
e.	Increasing physical conditioning	1	2	3	4	5
f.	Improved mental alertness	1	2	3	4	5
g.	Reduce risk of heart attack	1	2	3	4	5
h.	Lower blood pressure	1	2	3	4	5
i.	Be with friends/social	1	2	3	4	5
j.	Improved health	1	2	3	4	5
k.	Feeling younger	1	2	3	4	5
l.	Sense of accomplishment	1	2	3	4	5
m.	Release of tension	1	2	3	4	5

		Strongly Agree				Strongly Disagree
		1	2	3	4	5
A major reason for getting me to start an exercise program is....						
a.	Doctor's recommendation	1	2	3	4	5
b.	Advertisement on television	1	2	3	4	5
c.	Difficulty in climbing stairs	1	2	3	4	5
d.	Not fitting comfortably into clothing	1	2	3	4	5
e.	Advice from friends	1	2	3	4	5
f.	Advice from family	1	2	3	4	5
g.	Illness of family member	1	2	3	4	5
h.	Illness of friends	1	2	3	4	5
i.	Newspaper/magazine article	1	2	3	4	5
j.	Difficulty in doing daily chores	1	2	3	4	5
k.	Shortness of breath	1	2	3	4	5
l.	Availability of exercise program	1	2	3	4	5

To what extent are you influenced by, seek advice from, or seek support and approval from the following person(s) regarding your exercise and health habits?
Please use the following scale and circle your answer.

1 = Extremely influenced
2 = Moderately influenced
3 = Somewhat influenced
4 = Little influenced
5 = Not influenced at all

		Extremely Influenced				Not Influenced At All
		1	2	3	4	5
a.	My spouse	1	2	3	4	5
b.	My parent(s)	1	2	3	4	5
c.	My brothers or sisters	1	2	3	4	5
d.	My children	1	2	3	4	5
e.	My physician	1	2	3	4	5
f.	My pastor	1	2	3	4	5
g.	My counselor	1	2	3	4	5
h.	My friends	1	2	3	4	5
i.	My co-workers	1	2	3	4	5
j.	My instructors	1	2	3	4	5
k.	My grandchildren	1	2	3	4	5

Perceptions of Health Questionnaire

Please indicate how much you agree or disagree with the following statements. Please use the following scale and circle your answer.

1 = Strongly agree
2 = Somewhat agree
3 = No opinion
4 = Somewhat disagree
5 = Strongly disagree

		Strongly Agree				Strongly Disagree
		1	2	3	4	5
1.	If I get sick, it is my own behavior which determines how soon I get well	1	2	3	4	5
2.	I am in control of my health	1	2	3	4	5
3.	When I get sick I am to blame	1	2	3	4	5
4.	The main thing which affects my health is what I myself do	1	2	3	4	5
5.	If I take care of myself, I can avoid illness	1	2	3	4	5
6.	If I take the right actions, I can stay healthy	1	2	3	4	5
7.	Having regular contact with my physician is the best way for me to avoid illness	1	2	3	4	5
8.	Whenever I don't feel well, I should consult a medically trained professional	1	2	3	4	5

9.	My family has a lot to do with my becoming sick or staying healthy	1	2	3	4	5
10.	Health professionals control my health	1	2	3	4	5
11.	Whenever I recover from an illness,it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.	1	2	3	4	5
12.	Regarding my health, I can only do what my doctor tells me to do	1	2	3	4	5
13.	No matter what I do, if I am going to get sick, I will get sick	1	2	3	4	5
14.	Most things that affect my health happen to me by accident	1	2	3	4	5
15.	Luck plays a big part in determining how soon I will recover from an illness	1	2	3	4	5
16.	My good health is largely a matter of good fortune	1	2	3	4	5
17.	No matter what I do, I'm likely to get sick	1	2	3	4	5
18.	If it's meant to be, I will stay healthy	1	2	3	4	5

Aging Opinion Survey

Please indicate how much you agree or disagree with the following statements. Please use the following scale and circle your answer.

1 = Strongly agree
2 = Somewhat agree
3 = No opinion
4 = Somewhat disagree
5 = Strongly disagree

		Strongly Agree				Strongly Disagree
		1	2	3	4	5
1.	I dread the day I would look in the mirror and see gray hairs.	1	2	3	4	5
2.	The older I become the more I worry about my health.	1	2	3	4	5
3.	Most older people seem to need a lot of extra sleep to have enough energy for everyday chores.	1	2	3	4	5
4.	I fear that when I'm older all my friends will be gone.	1	2	3	4	5
5.	The older I become, the more anxious I am about the future.	1	2	3	4	5
6.	It's best to forget that we're getting older every day.	1	2	3	4	5
7.	The older I get the more I worry about money matters.	1	2	3	4	5
8.	I have become more content with the years.	1	2	3	4	5

9.	I dread the days when I can no longer get around on my own.	1	2	3	4	5
10.	I am sure that I will always have plenty of friends to talk to.	1	2	3	4	5
11.	I never think about dying.	1	2	3	4	5
12.	The thought of outliving my spouse frightens me.	1	2	3	4	5
13.	Financial dependence on my children in old age is one of my greatest fears.	1	2	3	4	5
14.	I know I'll enjoy sexual relations no matter how old I am.	1	2	3	4	5
15.	You can keep the joys of grand-parenthood, I'd rather be young.	1	2	3	4	5

Health History Questionnaire

1. Do you smoke cigarettes? Yes____ No____
   If yes, how much? ____ packs/day
   If yes, how long have you smoked? ____ years

2. Have you ever experienced or been told that you have:

			Explanation (When, What)
A.	Excessive shortness of breath	____Yes ____No	_____
B.	Chest pains	____Yes ____No	_____
C.	Leg cramps or leg pains without hard exercise	____Yes ____No	_____
D.	Obesity	____Yes ____No	_____
E.	Kidney problems	____Yes ____No	_____
F.	Diabetes or sugar	____Yes ____No	_____
G.	High blood cholesterol or triglycerides	____Yes ____No	_____
	If yes, do you take insulin or other medicine for this condition?	_____	
H.	Broken bones	____Yes ____No	_____
I.	Frequent or severe headaches	____Yes ____No	_____
J.	Heart problems	____Yes ____No	_____

3. How much have you had to stay home (or in the hospital) due to illness over the past year?

____ Less than 2 days

____ 3 days to 1 week

____ 1 - 4 weeks

____ 5 weeks - 3 months

____ 3 - 6 months

____ Greater than 6 months

4. How often do you usually become ill? (Include colds, flu, infections, heart and lung problems, etc.)

____ Less than 2 times/year

____ 3-6 times/year

____ Greater than 6 times/year

5. Compared to your general health 5 years ago, you feel you are:

____ In better general health

____ In about the same general health

____ In worse general health

6. What do you think is your worst health problem?

_____

_____

Activity Questionnaire

Directions: The following questionnaire is designed to help us better understand the physical activity patterns of adults. There is no right or wrong answer to these questions, and all responses will be strictly confidential. Thus, we hope you will respond to these questions as honestly as possible.

Sex M F Age _____ Height _____ Weight _____

Occupation _____

Years of Education 1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20

Activity Patterns: Record the number of days per week and minutes per day that you regularly participated in the following types of physical activity during the past 12 months.

Activity	Mos/ Year	Days/ Week	Min/ Day
a. Walking for fitness/conditioning			
b. Walk for pleasure/recreation			
c. Jogging			
d. Swimming for training/conditioning			
e. Swimming for pleasure/recreation			
f. Bicycling for training/conditioning			
g. Bicycling for pleasure/recreation			
h. Dance/Aerobics			
i. Cross country skiing			
j. Weight training			

Activity	Mos/ Year	Days/ Week	Min/ Day
k. Tennis			
l. Hand/Racquetball			
m. Golf			
n. Softball			
o. Baseball			
p. Basketball			
q. Soccer			
r. Skiing (only count actual time skiing)			
s. Bowling			
t. Backpacking/Hunting/Hiking			
u. Other 1 (list)			
v. Other 2 (list)			

APPENDIX B

TABLES

Table 1

Mean Differences Between Younger and Older Samples on HBM Predictors and Activity

Variable	Younger[a] M	Younger[a] SD	Older[b] M	Older[b] SD	p[c]
1. Barriers[d] (17)	41.50	11.17	32.54	13.92	.000
2. Benefits (12)	48.00	9.08	45.94	15.27	.316
3. Cues (12)	29.44	10.56	25.44	12.93	.046
4. Risks (16)	35.30	11.49	39.19	15.28	.087
5. Support (11)	24.43	7.75	19.56	7.97	.000
6. Internal (6)	22.65	4.79	22.32	4.79	.688
7. Others (6)	14.02	4.48	17.15	4.62	.000
8. Chance (6)	13.58	4.33	14.20	5.32	.446
9. Anxiety (15)	46.41	8.28	39.80	9.16	.000
10. Health	2.13	.62	2.04	.70	.437
11. Activity[e]	5.60	3.30	2.06	1.25	.000

Note. Variables 1-9 are 5-point Likert-type scales and data was recoded so that higher scores represent stronger agreement; variable 10 is a 3-point scale where higher scores represent better health.

[a]n = 88. [b]n = 54 (only subjects with complete data were included in analysis). [c]probability of F (1,140). [d]each variable is defined by a sum of its items (number of items is in parentheses). [e]a frequency count indicating the number of activities (Range = 0 to 21) participated in at least once during the previous 12 months.

Table 2
Correlations Among Predictors and Activity: Younger Sample

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Barriers	-												
2 Benefits	.13	-											
3 Cues	.44**	.19	-										
4 Risks	.41**	.15	.44**	-									
5 Support	.19	.24*	.35**	.30**	-								
6 Internal	-.26*	.16	-.09	-.09	-.13	-							
7 Others	.18	.16	.31**	.20	.35**	.19	-						
8 Chance	.33**	.16	.16	.14	.10	-.32**	.17	-					
9 Anxiety	.26*	.19	.36**	.29**	.21*	-.10	.25*	.45**	-				
10 Health	.11	.04	-.07	-.23*	-.12	.03	-.03	.04	-.12	-			
11 Age	-.17	-.13	.07	.02	-.09	.01	-.15	-.16	-.10	-.13	-		
12 Sex	.27*	.02	.09	.15	.23*	-.07	.18	.06	.12	.00	.05	-	
13 Activity	-.06	.35**	.06	.10	.34**	.17	.13	.04	-.12	-.12	-.18	-.18	-

Note. * $p < .05$, ** $p < .01$

Table 3

Correlations Among Predictors and Activity: Older Sample

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Barriers	-												
2 Benefits	.57**	-											
3 Cues	.54**	.42**	-										
4 Risks	.38**	.25	.49**	-									
5 Support	.26*	.09	.32*	.46**	-								
6 Internal	.06	.11	.02	-.23	.09	-							
7 Others	-.11	-.26*	.04	.28*	.28*	-.17	-						
8 Chance	.16	.06	.14	.18	-.09	-.21	.26*	-					
9 Anxiety	.33*	.23	.25	.42**	.03	-.21	.11	.08	-				
10 Health	-.03	-.18	-.08	-.30*	-.08	-.08	.06	-.04	-.13	-			
11 Age	-.35**	-.23	-.21	-.14	-.17	.03	.16	.08	-.20	.07	-		
12 Sex	-.02	-.05	-.22	.19	.09	.17	.22	-.07	.13	.07	.11	-	
13 Activity	-.03	.26*	.10	.20	.16	-.07	.01	-.05	.09	-.03	-.15	-.08	-

Note. * $p < .05$, ** $p < .01$

Table 4

Regression Analyses Predicting Activity for the Combined Sample and for the Younger and Older Samples Separately

	Predictors[a]	F[b]	Beta	Adj. R^2
Younger and Older Sample Combined				
	Age	45.28	-.51	.26
	Support	30.78	.27	.32
	Sex	24.03	-.20	.35
	Benefits	20.27	.18	.37
	Barriers	17.88	-.19	.40
Younger Sample Separately				
	Benefits	12.31	.36	.12
	Support	9.77	.26	.18
	Sex	9.80	-.28	.24
	Anxiety	8.88	-.21	.28
Older Sample Separately				
	Benefits	4.27	.31	.08

Note. [a]Forward regression model. [b] F value at entry ($p < .001$ for the combined and younger sample only analyses; $p < .05$ for the older sample analysis).

APPENDIX C

FIGURES

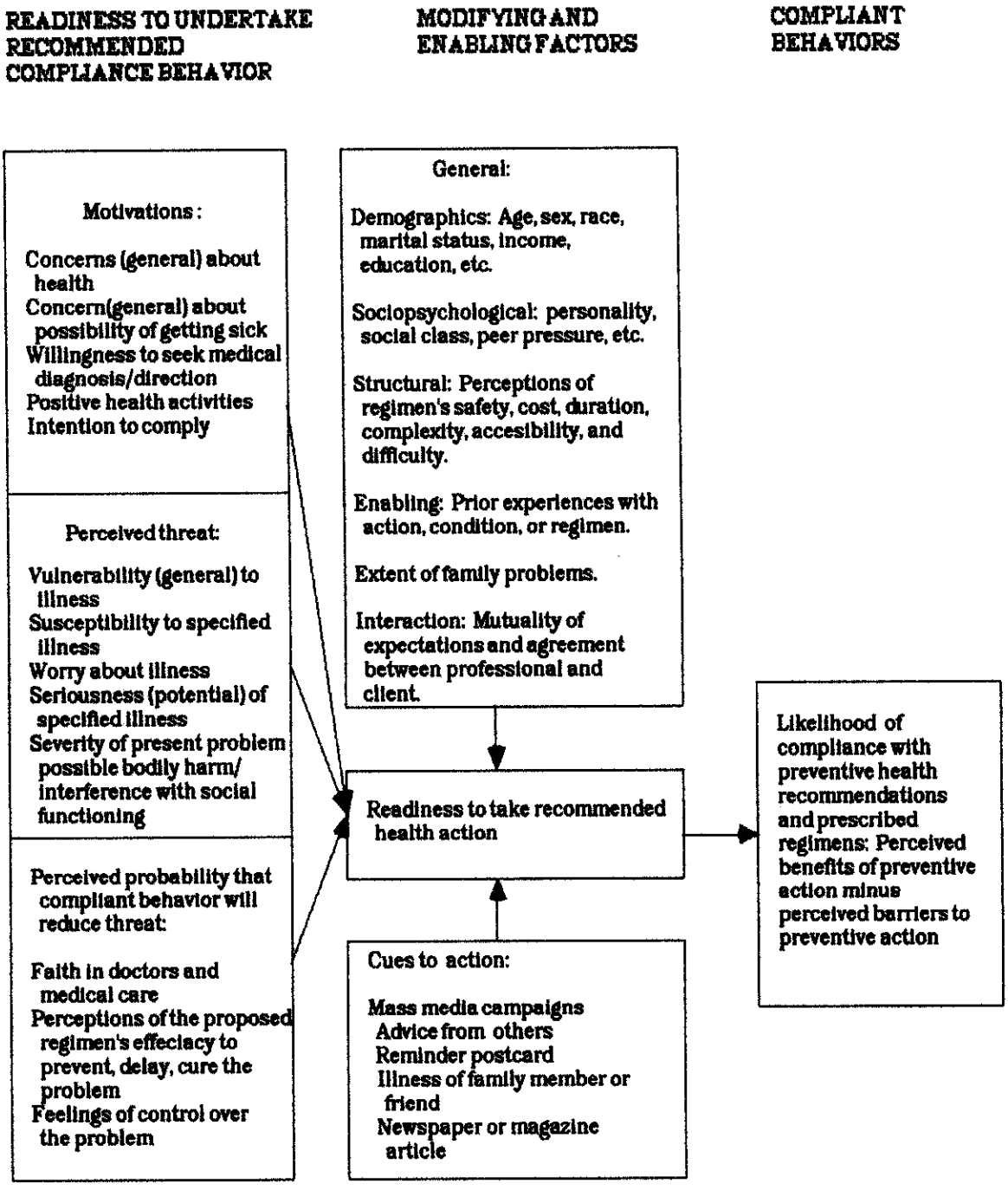

Figure 1: The Health Belief Model for Predicting and Explaining Compliance Behavior (Becker & Maiman, 1975; Becker et al, 1974)

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