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Vince Worthington
Grand Valley State University

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**HEALTH BELIEFS AND ADHERENCE
TO CARDIAC EXERCISE FOLLOWING
A CARDIAC EVENT**

By

Vince Worthington

A THESIS

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Grand Valley State University
in partial fulfillment of the requirements for the degree of**

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Committee Members:

Katherine Kim Ph.D, R.N.

Phyllis Gendler Ph.D, R.N., C.S., FNP, GNP

James Scott PES

ABSTRACT

HEALTH BELIEFS AND ADHERENCE TO CARDIAC EXERCISE FOLLOWING A CARDIAC EVENT

By

Vincent G. Worthington

The purpose of this study was to examine the relationship between health beliefs and adherence to cardiac exercise at eighteen to twenty four months post cardiac event. Ninety subjects participated in a study by Foster (1995) and McGinn (1995), examining the relationship of health beliefs and adherence to cardiac exercise six to eight weeks post cardiac event. This study contacted the same sample at eighteen to twenty four months post cardiac event. Thirty five subjects responded to a mailed questionnaire measuring perceived benefits, perceived barriers, self-efficacy, adherence to exercise, and demographic information.

Descriptive analysis of the data was conducted as well as t-test. The data did not show a significant difference in the health beliefs between adherent and non-adherent subjects. The data also did not show a significant difference in health beliefs when comparing the two time periods. Limitations of the study included a small sample size and sample bias limiting interpretation of the results.

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CHAPTER 1

INTRODUCTION

Cardiovascular disease remains the number one killer in the United States, despite the tremendous progress in medical technology. According to the American Heart Association (AHA) (1995), cardiovascular diseases killed more Americans than cancer, accidents, and chronic obstructive pulmonary disease combined in 1991. This represents 42.5 % of all deaths in the United States in that year (A.H.A., 1995). Many improvements have been made in the diagnosis and treatment of cardiovascular disease in the last 30 years. The age adjusted death rate per 100,000 population has decreased more than 50% in that time period (A.H.A., 1995). Although this is a step in the right direction, it is not under control.

The impact of exercise and lifestyle changes on cardiovascular disease and overall health has been well documented in the literature since the 1960's. Early studies by Morris, Chave, and Adam (1973) examined specifically physical exercise and incidence of cardiovascular disease, demonstrating a beneficial effect of exercise on risk of heart attack. The Framingham Study (Kannel, Wilson, & Blair, 1985) supported earlier work, finding a reduced coronary mortality associated with increased levels of physical activity. A more recent meta-analysis of physical activity in the prevention of cardiovascular disease done by Berlin and Colditz (1990) confirmed the increased risk associated with inactivity in a sedentary population.

Further research has broadened the early work to address risk factors other than just exercise. These risk factors include smoking, high blood pressure, diabetes, and blood

cholesterol level. Siegel, Grady, Brower, and Hully (1988) demonstrated that survivors of myocardial infarction (MI) can reduce the risk of future events by modifying these established risk factors. Meta-analysis of trials of cardiac rehabilitation consisting of some combination of risk factor management and exercise conditioning suggest there may be as much as a 25% reduction in fatal events during the first 3.5 years after an MI (Oldridge, 1991). The most aggressive lifestyle intervention trial was done by Ornish et al. (1990). This trial randomized subjects to an aggressive lifestyle modification program consisting of a very low-fat vegetarian diet, mild to moderate exercise, stress management, and group support. Over a one year period subjects consistently showed regression of coronary artery stenosis.

More recently, Blair et al. (1996) compared cardiorespiratory fitness to the other coronary disease risk factors in relation to overall mortality. Moderate fitness levels seemed to protect against other risk factors including current smoking, elevated blood pressure, and elevated cholesterol levels. This is the strongest statement as to the importance of physical activity in reducing mortality from coronary disease. The Centers for Disease Control (CDC) in collaboration with the Presidents' Council on Physical Fitness and Sports released a report by the surgeon general in July 1996 supporting the benefits of regular physical activity for people of all ages. Because inactivity is such an important risk factor for early mortality, the CDC has launched a campaign to promote regular physical activity called the National Physical Activity Initiative. Researchers are in agreement that to obtain the maximal benefit from lifestyle changes, these changes must

be continued for long periods of time. This belief has prompted many researchers to investigate the adherence to lifestyle changes over a period of time.

Oldrige (1991) suggested that 40 to 50 % of patients drop out of a cardiac rehabilitation program in the first 6 to 12 months. In an earlier study he documented a drop out rate of 46.5 % over a three year period, with the majority of the drop outs occurring in the first 6 months (Oldrige et al., 1983). Little has been done to understand what changes over time that allows some people to continue with programs and others to stop.

The Health Belief Model (HBM) was developed in the 1950's to provide a framework to explain the variables that relate to compliant health behavior. According to the model, a number of variables are associated with the likelihood of taking preventative action (Becker & Maiman, 1975). The likelihood of taking action depends on beliefs about the effectiveness, or perceived benefits, of action in reducing the health threat and the difficulties, or perceived barriers, that must be encountered if such action is taken (Becker et al., 1977). Other variables in the model include perceived seriousness, perceived susceptibility and health motivation. The concept of self-efficacy was added to the model in recent years. The Health Belief Model has been widely used in research examining a variety of health behaviors. Several studies have utilized the concepts of the HBM to analyze the adherence of individuals, post cardiac event, to a cardiac rehabilitation or exercise program (Tirrell & Hart, 1980; Robertson & Keller, 1992; Foster, 1995).

Adherence has been defined as the extent to which an individual's behavior coincides with medical advice. In relation to cardiac exercise, adherence would be the extent to which an individual's behavior coincides with the prescribed cardiac exercise program. Some studies have used the term compliance to mean the same as adherence. Tirrell and Hart (1980) found that the variables of perceived benefits and perceived barriers, along with the knowledge of exercise, demonstrated the strongest relationship to compliance levels. Robertson and Keller (1992) investigated a similar population and also found perceived barriers to be inversely related to exercise compliance. Foster (1995) supported the findings of Tirrell and Hart (1980) and further demonstrated self-efficacy as an indicator of adherence to cardiac exercise at a period of 6 to 8 weeks following a cardiac event.

Other research has documented that adherence fades with time (Oldrige et al., 1983). Little work has been done to investigate the changes in health beliefs over time and compare them to adherence over time. The purpose of this study was to support and expand the findings of Foster (1995) by examining the health beliefs and adherence of the same sample at a later time period of 18 to 24 months following the cardiac event. The comparison of the health beliefs at the two time intervals expanded the knowledge regarding health beliefs and adherence to prescribed therapy, as well as guide nursing interventions to assist patients in the maintenance of long term positive health behaviors.

Purpose

The purpose of this study was to determine: (1) if the strengths of the health beliefs of an individual who is adherent to an exercise program differ from an individual

non-adherent to an exercise program 18 to 24 months following a cardiac event; (2) if the strengths of the health beliefs change over time; and (3) if adherence levels changes over time.

CHAPTER II

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

Conceptual Framework

The Health Belief Model (HBM) was developed in the 1950's by G. M. Hochbaum, S.S Kegeles, H. Leventhal, and I. M. Rosenstock to answer questions about why some people use health services and others do not. The work originated with concern about why people were not participating in preventative health programs being provided free of charge or at low cost (Becker et al., 1977). The HBM offered a framework from which to investigate factors that influenced people's decisions regarding health behaviors.

The concepts of the HBM were drawn from one concept of the social psychological theory of Kurt Lewin (1944). Lewin believed that it is the individual's perception of the positive and negative effects of the behavior, that determines the probability of the occurrence of the behavior. One aspect of Lewin's theory that was adapted to the HBM concepts is the level-of-aspiration regarding attaining goals. The choice between different levels of difficulty, when deciding on action to be taken, is made on the basis of the relative level of potential success or failure. The HBM assumes that a person's attitudes and beliefs are important determinants of his/her health behaviors. The HBM hypothesizes that individuals will not seek preventative care unless they 1) possess a minimal level of knowledge, 2) view themselves as potentially vulnerable, 3) perceive the condition as threatening, 4) are convinced of the efficacy of intervention, 5) see few

barriers in understanding or attaining the recommended action, and 6) are generally concerned about health and seeking health related information.

The HBM concepts related to adherence to preventive care following a cardiac event include perceived susceptibility, perceived seriousness, perceived threat, perceived benefits, perceived barriers, general health motivation, modifying factors, cues to action, and self-efficacy (Rosenstock, Stretcher, & Becker, 1988). The first three concepts are related but distinctly different. Perceived susceptibility to disease is the individual's perceived probability to developing further cardiovascular disease. Perceived seriousness of disease is the individual's perception of the consequences of contracting further disease. This is either the degree of emotional arousal created by the thought of the disease, or the difficulties the individual believes the disease would create. Perceived susceptibility and perceived seriousness combined would equal the perceived threat.

Perceived benefits and barriers are concepts usually measured against one another. Benefits are beliefs regarding the effectiveness of the recommended action following a cardiac event: the individual's evaluation of the advocated behaviors in terms of feasibility and efficacy. Perceived or real factors that prevent involvement in recommended action following a cardiac event are considered barriers. Examples of these would be cost, inconvenience, fear of pain or change.

Other HBM concepts include general health motivation, modifying factors, and cues to action. Health motivation is a person's general concern for health and the tendency to seek health related information and participate in health related behaviors. Modifying factors are variables that affect the predisposition to secondary preventive

action, such as cardiac rehabilitation. Modifying factors include demographic, sociopsychologic, and structural factors, such as complexity and symptoms associated with regime. Cues to action are stimuli that occur to trigger appropriate action. These cues may be internal, such as symptoms, fatigue, or recall of the condition, or external, as mass media, advice from others, or newspapers.

The concept of self-efficacy was recently added to the HBM to further explain health behaviors when applying the model to initiation, and maintenance of lifestyle changes. It was adopted from Bandura's (1977) Social Cognitive Theory. Bandura's theory suggests that a person's perceptions of ability affect behavior, level of motivation, thought patterns, and emotional reactions to situations. The concept of self-efficacy has two types of expectancies that influence behavior: efficacy expectation and outcome expectation. Efficacy expectation refers to an individual's perceived ability to perform a behavior, and outcome expectation is the belief that outcomes may result from engaging in a specific behavior. Rosenstock, Stretcher, and Becker (1988) noted that when working to modify lifelong habits, such as eating, exercising, or smoking, an individual requires a good deal of confidence that he/she can alter such behaviors.

In summary, the theoretical constructs of the HBM are offered as a basis to predict and explain health behaviors, adherence to prescribed therapies, and response to symptoms. According to Rosenstock et al. (1988), for behavioral changes to occur, people must have incentive to take action, feel threatened by their current behavioral patterns, and believe that change of a specific kind will be beneficial by resulting in a valued outcome at acceptable cost. people must also feel competent to implement the

change. In many studies, the HBM concepts of benefits, barriers, and self-efficacy have shown the strongest relation to adherence over time. In this study the concepts of perceived benefits, perceived barriers, and self-efficacy were investigated in relation to adherence to a cardiac exercise program over a 18 to 24 month time period.

Literature Review

The HBM has been used by many researchers over the years as a theoretical framework for investigation into health behaviors. Many investigators have used the HBM in studies of adherence to health behaviors. Specific investigation into the relationship of health behaviors and adherence to cardiac exercise programs are few. Even fewer are studies of health beliefs and adherence to cardiac exercise over time. The literature review here will focus on the HBM, specifically the concepts of perceived benefits, perceived barriers, and self-efficacy, and the concept of adherence to a cardiac exercise program.

Health Belief Model

The HBM provides a framework for investigating the relationship between health beliefs and adherence of an individual with coronary disease, to a cardiac exercise program. The model suggests if one has strong beliefs of the benefits of cardiac exercise, perceives self-efficacy to perform an exercise program, while perceiving few barriers, one would be more adherent to a cardiac exercise program.

Research using the HBM, not limited to cardiovascular issues, includes a study by Janz and Becker (1984) who identified perceived barriers as the most powerful HBM dimension. Kim, Horan, Gendler, and Patel (1991) developed the Osteoporosis Health

Belief Scale (OHBS) to measure health beliefs as they relate to osteoporosis. The questionnaire was distributed to a large convenience sample of 150 elderly. Results of the discriminant function analysis of the OHBS showed barriers and health motivation to be very important variables in explaining both calcium intake and exercise behaviors of the elderly.

Barriers to the use of sunscreen were identified as the most influential variable for Wisconsin dairy farmers. Marlenga (1995) mailed surveys to 535 dairy farmers to identify health beliefs and skin cancer prevention practices. Two hundred and two farmers responded to the survey. The study sample was found to be knowledgeable about skin cancer and felt susceptible to the disease, but less than half of the sample took preventive action. In this study perceived barriers were the only predictor of the health behavior.

Champion (1987) examined the relationship of five HBM concepts: benefits, barriers, susceptibility, severity, health motivation, and knowledge, to the frequency of breast self-examination (SBE). A convenience sample of 585 women, with the mean age of 33 years, was approached in a waiting room of an outpatient clinic to complete a questionnaire based on the HBM concepts, and knowledge and perceived susceptibility. The research demonstrated an increased frequency of SBE among individuals receiving education by a health professional. The study supports and validates the importance of health teaching by a health professional, as is done in a cardiac rehabilitation setting. The results are consistent with the previous work of Champion (1985).

Price and Everett (1994) investigated health beliefs related to smoking in an economically disadvantaged population. They used a telephone survey of 500

participants. They compared many variables including demographic information, smoking status, and HBM variables of perceived susceptibility, perceived seriousness, benefits and barriers. The people who were currently smoking perceived themselves as more susceptible to lung cancer than those who did not, and former smokers perceived themselves as more susceptible to lung cancer than non-smokers. Analysis of variance failed to detect any significant differences in perceived barriers between smokers and non-smokers. Smokers and the least educated perceived fewer benefits to quitting smoking than former or non-smokers and the more highly educated. This study supported the approach that those most likely to attempt to quit smoking are younger and of a higher education level. This study supports the ability of the HBM to identify demographic variables in a population that influence health behaviors.

Hiatt, Hoeshell-Nelson, and Zimmerman (1990) studied factors influencing patients' entrance into a cardiac rehabilitation program. They administered a questionnaire based on the HBM variables of perceived susceptibility, seriousness, benefits, and barriers to 39 discharged cardiac patients. Results of this descriptive, correlational research identified significant differences in perceived barriers and benefits between subjects who chose to attend outpatient cardiac rehabilitation and those who did not attend. Demographic variables revealed that patients who were married or had incomes greater than \$20,000 per year, perceived more benefits and fewer barriers. They found no significant differences between the groups for perceived seriousness or susceptibility. Limitations of the study include a small, convenience sample, and a single institution study. The individual perception of barriers has been most consistently associated with

cardiovascular health behaviors (Kirscht, Janz, & Becker, 1987; Kirscht & Rosenstock, 1977; Tirrell & Hart, 1980). The study by Tirrell and Hart (1980) looked at the relationship of health beliefs and knowledge to exercise compliance post coronary artery bypass surgery. Twenty-six men and four women were interviewed ten to twelve months post cardiac event. Correlation between exercise compliance and the HBM variables of severity, susceptibility, barriers, health motivation, and efficacy were examined. The strongest relationship was seen between the perception of barriers and the recommended exercise compliance. They identified that the greater the number of barriers, the lower the level of adherence. This study looked at compliance one year from the cardiac event. The single measurement of the variables limits the ability to generalize the findings to adherence over time.

The HBM suggests that people are more likely to engage in health behaviors if they perceive the action is effective in preventing, detecting, or treating disease. Dia and Cantanzaro (1987) found perceived benefits to be a strong variable related to compliance, in a study that examined health beliefs and adherence to a skin care regime among twenty paraplegic male outpatients. While this study supports the importance of the HBM variable of benefits, it also found the four variables of the HBM (benefits, barriers, susceptibility, and severity) to have a synergistic influence on compliance. They found the level of compliance to be more predictable if taken as a composite of the variables (1987). The findings also support the importance of education in techniques of skin care and prevention to increasing compliance.

Perceived benefits to cardiovascular risk factor modification have been related to adherence to antihypertensive medication regime and participation in a regular physical activity program (Hiatt et al., 1990; Kirscht & Rosenstock, 1977; Mirotznik et al., 1985). Muench (1987) studied seventy-two subjects enrolled in a cardiac rehabilitation program with respect to their health behaviors and the HBM variables of susceptibility, seriousness, benefits, and barriers. The subjects were enrolled in the program for varying time intervals, from one to twenty four months. Muench reported that cardiac rehabilitation patients who perceived more benefits from program participation also reported fewer barriers to adherence. No significant relationships were noted between time in the program and HBM variables and self-efficacy. Muench also reported a strong relationship between support of a close relative and adherence to a program. This study is particularly significant in relation to the current study because it measured HBM variables at different time intervals.

Self-Efficacy

Social Cognitive Theory and the concept of self-efficacy have been used as a framework for predicting health behaviors including smoking cessation, weight control, physical activity, and cardiac rehabilitation (Clark et al., 1995; Coehlo, 1985; Jeffry et al., 1984; Kelly, Zyzanski, & Alemagno, 1991; Schuster & Waldron, 1991; Stanley & Maddux, 1986; Taylor et al., 1985). These studies indicated self-efficacy as a consistent predictor of health behavior and that interventions can enhance self-efficacy.

Kelly, Zyzanski, and Alemagno (1991) looked at the role of perceived risk of behavior, perceived benefit of behavior change, social support and self-efficacy in

predicting motivation and behavior change regarding life style. They included six lifestyle areas; cigarette smoking, dealing with stress, amount and type of food eaten, use of seat belts, and exercise habits. The subjects were 215 patients in a primary care medical practice. Behavior change was poorly predicted by perceived risk, perceived benefit, social support, or self-efficacy. When the variable of motivation was added to perceived benefit, perceived risk, social support, and self-efficacy, the prediction of behavior change became very accurate. The strongest predictors of motivation for the lifestyle changes were perceived benefits and self-efficacy. This suggests that motivation is an important variable when looking at behavior change, and that self-efficacy may be an important component of motivation. The behavior change was measured by a telephone interview four weeks following the initial intervention. The amount of lifestyle change that was introduced and expected to occur in the four week period may be a limiting factor in this study.

Kaplan, Atkins, and Reinsch (1984) tested the relationship of self-efficacy to compliance with a medically prescribed walking program among subjects with chronic obstructive pulmonary disease. The relationship was supported by the following findings: (a) adherence to the walking program resulted in increased subject's expectation of his/her ability to accomplish the behavior in the future; (b) these expectations were associated with increased performance (achieving a higher workload) on a treadmill exercise test, three months later; and (c) significant correlations between perceived self-efficacy and specifically walking. There was no correlation between self-efficacy and general exertion.

Desharnais, Boullin, and Godin (1986) studied 98 healthy adults. They found that an expectation of self-efficacy was more a determinant of adherence to regular physical exercise than was the expectation of outcome, although both variables were significantly related to exercise adherence. The implications of the outcome expectation for people with coronary disease may be different than that of healthy adults engaging in an exercise program. Stanley and Maddux (1986) supported that individual intention to participate in an exercise program was influenced by both perceived personal ability to initiate the behavior and the expected outcomes of participation. This study was again in healthy adults.

Ewart, Taylor, Reese, and DeBusk (1983) looked at self-efficacy in 40 subjects with uncomplicated myocardial infarction three weeks after their cardiac event. They measured self-efficacy before and after a clinical exercise test. They found that after completing an exercise test that was not limited by angina pectoris, subjects had increases in self-efficacy expectation for most physical activities. They also noted that in subjects who experienced angina pectoris during the exercise test, self efficacy scores remained low or decreased after the exercise test. This implies that decreased physical capacity can influence self-efficacy in relation to physical activity and cardiac exercise. Ewart et al. (1983) measured self-efficacy after subjects received positive results from an exercise test very near the cardiac event. The positive results reinforced the subject's perceived ability to perform physical activity. The researchers comment on how the counseling and positive feedback also influences the self-efficacy of the subject. The small sample size of 40 subjects is a limitation of the Ewart et al. study.

Jeng and Braun (1995) specifically investigated exercise self-efficacy in cardiac rehabilitation patients. They developed a tool to measure self-efficacy in relation to cardiac exercise prior to exercise testing. They used a sample of twenty three participants in a cardiac rehabilitation program. The exercise confidence scale was administered to participants before entrance into the program. Findings indicated that patients who had higher exercise capacity scored higher on the exercise confidence scale. The researchers used the exercise confidence scale score to predict what levels of exercise a participant will be able to do. The researchers were able to accurately predict levels of exercise based on this score. The ability to accurately predict exercise levels based on exercise confidence scores is supportive of the HBM concept of self-efficacy. This study did not address adherence to exercise only exercise capacity. The small sample size and the use of only one test site are limitations to this study.

Many factors influence self-efficacy and the ability to perform cardiac exercise. Clark et al. (1995) investigated the relationship between socioeconomic status and exercise self-efficacy. They measured exercise self-efficacy by having 1944 seniors enrolled in the Group Health Cooperative of Puget Sound rate, on a scale of one to ten, how sure they were that they would exercise regularly in the coming year. They compared the exercise self-efficacy scores with socioeconomic variables including occupation, income, education, as well as other demographic variables and level of social support. The researchers found direct positive associations of age and education with exercise self-efficacy. Limitations to this study include a brief tool to measure exercise self-efficacy, only one question, and adherence to exercise or level of exercise achieved was not

measured. Shuster and Waldron (1991) explored gender differences in anxiety, self-efficacy, activity tolerance, and adherence in cardiac rehabilitation patients. One hundred and one patients participating in a cardiac rehabilitation phase II program were given two questionnaires to measure self-efficacy related to physical activity and anxiety. In the early weeks of the cardiac rehabilitation program women were more anxious, less efficacious, and less able to tolerate physical activity than men. These two studies imply that other factors must be considered when looking at cardiac exercise and self-efficacy.

Adherence

Adherence can be defined as the extent to which an individual's behavior coincides with medical or health advice. In much of the literature the term compliance is used in the same manner as adherence. Therefore, literature on compliance and adherence will be cited.

Cardiac rehabilitation programs have demonstrated effectiveness in numerous studies by comparing people who participate and those who do not. The literature agrees the maximum benefit from lifestyle changes is achieved when the adherence to the changes is maintained over long periods of time. Studies on exercise compliance have demonstrated compliance rates ranging from 40 to 60 % over a three year period post cardiac event (Oldridge, 1983) with the majority of the drop out occurring in the first year. Shepard, Corey, and Kavanagh (1981) reported a fivefold difference in fatal and nonfatal recurrences of MI between patients who dropped out of a cardiac rehabilitation program and those who complied. They measured adherence to a regular exercise program of 610 middle-aged men at a time period of two months to 109 months following a myocardial

infarction. They observed the sample for an average of 36.5 months showing that 82.8% of the sample adhered to their program. Because of the diversity in the time frame from event to start in this study, the sample at the end was not all at the same time frame post cardiac event. The compliance rate of 82.8 % is considerably higher than other literature. This may be explained by the diversity in time from event to entrance in the study. Drop out rates have been shown to decrease over time (Oldrige et al., 1983). Since many of the participants joined the study six months to 109 months post cardiac event, their compliance rate would be much higher than would be expected if they all started at similar times post event.

Miller, McMahon, and Johnson (1983) investigated adherence to the four most frequently prescribed risk factor modifications, and found best adherence to non-smoking (74%) followed by diet (58%), exercise (43%), and stress management (35%). This research suggests a high rate of noncompliance with some lifestyle modifications, and reinforces the importance of investigating ways to improve adherence to lifestyle changes.

Oldrige (1992) investigated factors associated with attendance in a three month outpatient, hospital based cardiac rehabilitation program. In the limited time frame, he identified a higher drop out rate among women than in men, and among younger patients (less than 54 years of age) than in those over 54 years of age. This study did not assess long term adherence to recommendations, just attendance at the program. It is difficult to say if the drop-outs had a different compliance rate over a long period of time, since this was not measured.

Robertson and Keller (1992) explored the relationships of health beliefs, self-efficacy, and adherence to cardiac exercise in a sample of 51 men and women who had undergone percutaneous transluminal coronary angioplasty (PTCA) or coronary artery bypass graft (CABG) surgery in the four to eight months prior to the study. They found that 94.1% of the sample did not have a formal exercise program, but the majority of the sample (87%) walked three or more times per week. There were positive relationships between activity and perceived benefits and activity and self-efficacy, supporting previous research. Perceived barriers had a significant negative relationship with activity. In addition they found a relationship between the type of surgery and activity. Those who had CABG surgery walked longer than those who had PTCA. The study by Robinson and Keller (1992) had a loose definition of activity. This may have contributed to the discrepancy in reporting low levels of formal exercise programs with high levels of activity.

Cardiac Rehabilitation

Cardiac rehabilitation is a program of cardiovascular risk factor modification that includes cardiac exercise, dietary intervention, and smoking cessation. For overall cardiovascular strengthening and conditioning, patients are instructed to exercise aerobically. Aerobic exercise includes the following three conditions: exercise performed three to five times a week, done in an intensity that raises the heart rate to 65 to 75 % of maximum, and lasts 30 to 45 minutes of rhythmic movement using the large muscle groups. The health benefits of cardiac exercise post cardiac event have been well documented in the literature (Wenger, 1984; Pollock, 1990; Franklin, 1990). Physical

activity has been linked with both reduced death rate from coronary artery disease and regression of atherosclerotic lesions (Blair et al., 1996; Nash, 1988; Ornish et al., 1995).

The review of literature points out several key areas for the current study to address regarding perceived benefits, perceived barriers, self-efficacy and adherence. There is not a consensus in the literature as to which health belief model variables are the most important. The studies by Marlenga (1995) and Tirrell and Hart (1980) identified perceived barriers as the strongest variable with compliance. A limitation to the Tirrell and Hart (1980) study was the single measurement made at 12 months post cardiac event. In the current research compliance, health beliefs, and self-efficacy was investigated eighteen months to two years post cardiac event and compared to compliance, health beliefs, and self efficacy at six to eight weeks post cardiac event. The two time frames for measurement was proposed to provide more data regarding the changes in health beliefs over time. Hiatt, Hoeshell-Nelson, and Zimmerman (1990) found a significant difference in perceived benefits and barriers between patients who entered into a cardiac rehabilitation program and those who did not. Those who participated in the program had higher perceived benefits and fewer perceived barriers. Health beliefs regarding lifestyle changes at entrance into a program may differ from health beliefs regarding lifestyle changes over time. The current study should expand on the findings of Hiatt, Hoeshell-Nelson, and Zimmerman (1990) by exploring the health belief variables post-cardiac rehabilitation.

Muench (1987) did study patients post-cardiac rehabilitation. The subjects who perceived more benefits from program participation also reported fewer barriers to

adherence. A strong relationship between support of relatives and adherence was also noted. Two limitations of the study by Muench (1987) included a variable enrollment time from cardiac event and only one measurement. Strategies the current study uses to avoid these limitations were, consistent enrollment time from cardiac event and use of two measures at different times.

Champion (1987) stressed the importance of education by a health professional in promoting changes in health behaviors. The current study subjects received health teaching in a cardiac rehabilitation setting by a health professional. The measurement of adherence, health beliefs and self-efficacy at the two time periods should added to the work of Champion (1987) by addressing changes in health behaviors over time.

The literature investigating self-efficacy and health behaviors identifies many areas for the current study to address. Kaplan, Atkins, and Reinsch (1984) noted a significant positive correlation between self-efficacy and adherence to a prescribed walking program. This identifies self-efficacy as an important factor but does not take in to account any other factors. The current research looked at health beliefs, self-efficacy, and demographic variables in relation to adherence. The work of Desharnais, Boullin, and Godin (1986) identified self-efficacy as more a determinant of adherence to exercise than outcome expectation. This study was limited to healthy adults and may not be consistent to a population with coronary disease. The current research only enrolled patients who have coronary disease. Ewart et al. (1983) noted an increase in self efficacy after receiving positive feedback from a health care provider. The absence of a counseling

session for the subjects in the current study allows for an accurate measurement of the stability of self-efficacy over time.

Jeng and Braun (1995) used self-efficacy in cardiac rehabilitation patients to predict exercise capacity. The current study did not measure exercise capacity to the extent that Jeng and Braun (1995) did, but does look at adherence over time. The implications from the Jeng and Braun (1995) study focus on the importance of self-efficacy and the ability to perform regular cardiac exercise. The current study measured self-efficacy and adherence over two time intervals, thus explores the relationship of self-efficacy and adherence to cardiac exercise over time, and expands the work of Jeng and Braun (1995).

Several researchers pointed out that other factors impact health beliefs and cardiac exercise. Clark et al. (1995) related socioeconomic factors, specifically age and education, to exercise self efficacy. Price and Everett (1994) related demographic variables of age and education to the health behavior of smoking. Schuster and Waldron (1991) noted large gender differences in cardiac rehabilitation patients. The current study measured all the demographic variables identified by Clark et al. (1995), Shuster and Waldron (1991), and Price and Everett (1994) to expand on their findings and explore the relationship in subjects with coronary artery disease.

The literature reviewed on adherence to cardiac exercise identified several areas for the current study to address. Shepard, Corey, and Kavanagh (1981) reported a very high adherence rate of 82.8%. The subjects were enrolled at varying times from coronary event. Oldrige (1992) showed a higher drop out rate from cardiac exercise in women and

younger people. Oldrige (1992) only made one measurement of adherence at three months post cardiac event. The current research used a consistent enrollment time frame and measured health beliefs, self-efficacy, and adherence at two specific time periods. The consistency of enrollment and the long term follow up of the sample adds to the research of Shepard, Corey, and Kavanagh (1981) and Oldrige (1992). Robertson and Keller (1992) identified a relationship between the type of invasive procedure done and activity. The measurement in the current study takes into account what type of cardiac event the subjects had.

In summary, there are certain variables believed to influence taking preventative health action. According to the HBM, adherence behaviors are more likely to occur if a cardiac patient perceives benefits to a cardiac exercise program while perceiving few barriers. The individual must also believe he or she is able to carry out the health recommendations. Most studies have supported a relationship between health behaviors and variables included in the HBM.

Cardiac disease continues to be a significant health problem. The research overwhelmingly supports benefits from long term adherence to lifestyle changes after a cardiac event including adherence to a cardiac exercise program. The research also continues to document overall low adherence rates. There is a need for further understanding of the process that facilitates or inhibits individual lifestyle outcomes over time. This information can provide meaningful interventions in supporting life style changes for the cardiac patient.

Research Hypothesis

The hypotheses tested in this study are: (1) perceived benefits, barriers, and self efficacy of individuals who are adherent to an exercise program for a period of 18 to 24 months post cardiac event will differ from those who are non-adherent and (2) perceived benefits, barriers, self- efficacy, and adherence levels will differ in individuals 6 to 8 weeks post cardiac event and 18 to 24 months post cardiac event.

Definition of Terms

Perceived benefits are beliefs regarding the effectiveness of the cardiac exercise program following a cardiac event. The individual's evaluation of the feasibility and efficacy of this behavior is included.

Perceived barriers are real or perceived factors that prevent involvement in cardiac exercise.

Self-efficacy is defined as the belief that one is capable of successfully accomplishing a particular behavior.

Adherence is the extent to which an individual's behavior coincides with prescribed cardiac exercise program.

Cardiac exercise program is an aerobic exercise program for cardiovascular training and muscular conditioning post cardiac event.

CHAPTER III

METHODOLOGY

Study Design

A cross-sectional, descriptive correlational design was used to examine the relationship between the HBM variables of perceived benefits, perceived barriers and self-efficacy among individuals adherent to an exercise program and those who were non-adherent. This is a follow up study to Foster (1995) and McGinn (1995), using the same sample. Data were obtained through the completion of instruments measuring health beliefs, self-efficacy, and exercise compliance from individual's 18 to 24 months following a cardiac event.

There may be other variables that could influence adherence to an exercise program over time. The presence of another chronic disease or complications of worsening coronary disease may inhibit exercise. These variables were included in the demographic questionnaire, which asked specifically if these threats were present. Influences by media, promotional campaigns by health organizations, or health care providers may have affected the study. Attrition of subjects over time may influence the results. Demographic characteristics of those who participated in the current study and those who did not, were compared (See chapter 4).

Advantages to using this type of study design is one of convenience and efficiency. The disadvantages of this design included; difficulty in interpreting correlational findings due to the inter-relationship among variables, alternative explanations for the findings, and a small sample size.

Sample and Setting

Subjects were selected from a 350 bed, acute care medical center in northwestern Michigan, and a 200 bed medical center in southwestern Michigan. The data were collected from a convenience sample of participants in the original study done by Foster (1995) and McGinn (1995). In the study by Foster (1995) and McGinn (1995) questionnaires were mailed to subjects after contact and consent to participate was obtained in the hospital. The original sample reported by Foster (1995) was 90 subjects. Four subjects entered late in the study had data collected but not used in the study by Foster (1995). For this study 90 questionnaires were sent out and 35 (39 %) were returned.

Eligibility criteria included:

1. Age 21 or older
2. Had documented coronary artery disease and a diagnosis of myocardial infarction or angina, or had undergone coronary artery bypass graft surgery, or angioplasty
3. Lack of significant cerebral, renal, pulmonary or cardiac complications that would prohibit participation in an exercise program
4. Literate in English language
5. Received in-hospital Cardiac Rehabilitation instruction
6. Participated in original study
7. Gave consent to participate in study

Instruments

The following instruments were used to collect data on the major variables of the study: (A) The Cardiac Exercise Health Belief Scale, (B) The Exercise Compliance Questionnaire, (C) The Cardiac Self-Efficacy Scale, and (D) the Demographic Questionnaire.

Cardiac Exercise Health Belief Scale

The Cardiac Exercise Health Belief Scale (CEHBS) was developed by McGinn (1995) to measure health beliefs to adherence to regular cardiac exercise program (See Appendix A). Items are reflective of the HBM variables of perceived benefits and perceived barriers. It was adopted from the Self Breast Examination instrument (Champion, 1984) and the Osteoporosis Health Belief Scale (Kim, Horan, Gendler, & Patel, 1991; Kim, Horan & Gendler, 1992). There are twenty items on the CEHBS, ten reflective of perceived benefits and ten perceived barriers. A five point rating scale was used to rate items from strongly disagree (1) to strongly agree (5). The minimum score on the benefits and barriers scale is ten with maximum score being fifty.

In development of the Cardiac Exercise Health Belief Scale, the instrument had been tested for face validity by cardiac rehabilitation experts. It was also reviewed by two elementary school teachers for readability and level of language used. Reliability of the instrument was evaluated by using the data from the original study. Internal consistency of the benefits and barriers subscales were evaluated to establish reliability. The original study by Foster (1995) reported Cronbach alpha coefficients ranges from .84 for barrier to .90 for benefit. Cronbach alpha coefficients for benefits and barriers was calculated on the

current data. Alpha coefficients for benefits were .91 and for barriers .72.

Exercise Compliance Questionnaire

The Exercise Compliance Questionnaire (ECQ) was used to measure adherence to exercise (See Appendix B). This questionnaire was developed by Radtke (1989) to determine how well patients complied with their prescribed home exercise program. The six questions were designed to examine the frequency, method, intensity, and duration of exercise. The answers were listed in numerical order from 1 to 5. The score is totaled according to the numbers selected.

To remain consistent with the original study by Foster (1995), to be considered adherent to the exercise program the individual needed to select two or higher on question one and two, and a total of five or more on questions one through four. A score of five or more on items one through four would be adherent. A score of less than five would be considered non-adherent to the exercise program. These questions focused on frequency, type, and duration of exercise. These are considered by the literature to be the determinants of exercise. Questions five through eight were for information only, not for determining adherence to the exercise program.

The content of the ECQ was reviewed for face validity by physical therapists who prescribe home exercise (Radtke, 1989). Radtke did not report the reliability of the instrument. Reliability was analyzed in the current study, revealing a Chronbach alpha coefficient of .60.

Cardiac Exercise Self-Efficacy Scale

Foster(1995) adoptedthe Cardiac Exercise Self-Efficacy Scale (CESES) from the Osteoporosis Self-Efficacy Scale (OSES) by Horan, Kim, and Gendler (1993). The OSES, exercise component, is a six item visual analog scale in which the lower anchor is "not confident at all" (0) and the upper anchor "very confident" (100). The total possible score ranges from zero to six hundred. A review of the literature provided the basis for item construction and nursing experts analyzed the items for content validity. Construct validity of the scale was determined by factor analysis. Criterion related validity of the instrument was evaluated by discriminant function analysis (Horan, Kim, & Gendler, 1993).

The CESES was set up like the OSES, using exercise behaviors (See Appendix C). The anchors and scoring were the same except, the total score on six items was used. Thus, the total score of the CESE ranged from 0 to 600. The reliability coefficient (Cronbach alpha) for internal consistency was .94 in the study by McGinn (1995). The reliability coefficient (Cronbach alpha) in the current study was .90.

The Demographic Data Sheet

Demographic data were obtained on a separate questionnaire, developed by Foster (1995) and McGinn (1995). . Items included age, sex, race, marital status, education, employment, income level, risk factor identification, medical insurance status, and type of cardiac event. A question regarding the presence of any physical limitations that may exclude one from exercise was included (See Appendix D).

Procedure for Data Collection

This study included participants from the original sample by Foster (1995) and McGinn (1995), all of whom had received a home exercise program during their initial hospitalization. The subjects were contacted by mail. A brief explanation of the purpose of the study, methodology, risks, potential benefits, voluntary participation, and the right to withdraw at anytime was included in a cover letter (See Appendix E). A written consent form was included in the initial mailing, with instructions to sign if they wished to participate (See Appendix F). Instructions to fill out the questionnaires and return them in the addressed and postage paid envelope also accompanied the initial mailing. Results of the study were made available to the subjects upon request to the researcher.

A follow up post card reminder was mailed two weeks following the initial mailing. Four weeks following the initial mailing a complete packet including a cover letter, the questionnaires, and return envelope postage paid, were sent to those who did not return the questionnaires at that time.

Human Subject Consideration

Before data collection began, the proposal was submitted to and approved by the Grand Valley State University Human Research Review Committee and study hospitals (See Appendix G). There were no expected risks to the subjects in this study. Fatigue or boredom may have been a risk due to the number of questions to be answered on the tool. Psychologic or emotional anxiety may have occurred resulting from self assessment and self-disclosure in answering questions on the tool. A possible benefit resulting from participation may have been the subject's heightened awareness of the importance of

exercise in recovery following a cardiac event. The consent form and the cover letter were specific to explain that participation was voluntary and that the participant may withdraw from the study at any time. The questionnaires were identified by number only to ensure confidentiality of the participants. At no time were names attached to results.

CHAPTER IV

RESULTS

Data were collected at two time intervals. The first study was conducted from August 15, 1994 to April 1, 1995 by Foster (1995) and McGinn (1995). The second study, the current study, was conducted from January 1, 1996 to August 1, 1996. The first study included 90 participants. Of the original sample, 39% ($n = 35$) responded to the second study.

Characteristics of the Subjects

Of the 90 participants in the first study (Foster, 1995; McGinn, 1995), 77% ($n = 69$) of the sample were male and 23% ($n = 21$) were female. Their ages ranged from 43 to 81 years with a mean age of 62 years ($SD = 10.22$). Ninety-five percent of the sample were Caucasian ($n = 85$), with 3% Native American ($n = 3$), 1% Black ($n = 1$), and 1% Hispanic ($n = 1$). Seventy-eight percent of the sample were married ($n = 70$) and 22 % were reported non-married ($n = 20$). Employment status of the sample included 41% working full-time ($n = 37$), 4% part-time ($n = 4$), and 55% retired ($n = 49$).

The subjects who did not respond to the second study were compared to the subjects who did respond. Demographic information collected during the first study was used to compare these two groups (See Table 1). Sixty one percent ($n = 55$) of the original sample did not respond to the second study. Of the subjects who did not respond, 5 were unable to be located, 3 had died since the first measurement, and the rest did not respond to the questionnaires. Seventy-one percent ($n = 39$) were male and the remaining were female.

Table 1

Comparison of Demographic Data Between Respondents to Second Study and Non-Respondents

	Respondent (n = 35)		Non-Respondent (n = 55)	
	n	%	n	%
Sex				
Male	30	86	39	71
Female	5	14	16	29
Age (in years)	Mean = 65.5 SD = 9.0		Mean = 59.8 SD = 10.3	
Marital Status				
Married	32*	91	38	69
Non-married	3	7	17	31
Race				
Caucasian	32	91	52	95
Native American	1	3	2	4
Hispanic	1	3	1	1
Employment				
Employed	12	34	27	49
Not Employed	23	66	28	51
Education (in years)	Mean = 13.5 SD = 3.1		Mean = 14.0 SD = 2.7	

*p < .05

Ages ranged from 39 to 85 years with a mean age of 59.8 years (SD = 10.3). The large majority of non-respondents were Caucasian. Sixty-nine percent were married and the remaining were non-married. About half of the non-respondents were employed (n=27).

Thirty five subjects responded to the second study. Eighty six percent (n = 30) were male and the remaining were female. Ages ranged from 48 to 84 with a mean age of 65 years (SD = 9.0). A large majority of the respondents were also Caucasian. Ninety one percent (n = 32) were married, while the remaining were non-married. About two-thirds of the respondents were not employed.

The differences in the demographic data between the respondents and the non-respondents were analyzed for statistical significance. In comparing the respondents to non-respondents there was a significant difference between the two groups in relation to marital status [$X^2(1, N = 90) = 6.17, p < .05$]. Subjects who responded to the second study were more likely to be married than those who did not. The remaining variables reported in table 1 were not significantly different between the two groups ($p > .05$).

The two groups were also compared using the health related behaviors of smoking, and eating a diet high in fat (See Table 2). This information was self-reported on the demographic questionnaire. There was a statistically significant difference in both of these areas between the groups. The non-respondents to the second study were more likely to smoke [$X^2(1, N = 90) = 6.17, p < .05$] and more likely to eat a diet high in fat [$X^2(1, N = 90) = 10.53, p < .05$].

Compliance to exercise at the time of the first study was also looked at for respondents and non-respondents. Of the non-respondents, 40% (n=22) were non-

compliant to exercise at the time of the first study. Of the 90 participants in the first study, 30 were considered non-compliant to exercise. This shows that 73% or 22 out of 30 non-compliant subjects, did not respond to the second study. Whereas, 55% of the 60 compliant subjects did respond to the second study

Table 2

Comparison of Health Related Behaviors of Smoking and High Fat Diet, Between Respondents and Non-respondents.

	Respondent (n = 35)		Non-Respondent (n = 55)	
	n	%	n	%
Smoking				
Yes	3*	8	17	31
No	32	92	38	69
High Fat Diet				
Yes	3*	8	22	40
No	32	92	33	60

* p <.05.

The respondents to the second study were divided in to two groups, adherent to exercise and non-adherent, using the score from the Exercise Compliance Questionnaire. Seventy seven percent (n = 27) of the respondents were adherent to exercise. Twenty percent (n = 7) were non-adherent to exercise, with one subject (3%) not answering the questions necessary to classify. Demographic information was compared between the adherent and non-adherent groups (See Table 3)

Demographic data for the adherent and non-adherent groups was analyzed for statistical significance. The Fishers exact test was used when comparing this nominal level

data, because of the small sample size. There were no statistically significant differences in the variables of marital status or employment status ($p > .05$). Because of the small sample size of the non-adherent group ($n = 7$) t-tests were not run to compare age or education level of these groups.

Table 3

Comparison of Demographic Information Between Subjects Adherent and Non-Adherent to Exercise.

	Adherent (n = 27)		Non-Adherent (n = 7)	
	n	%	n	%
Sex				
Male	24	89	5	71
Female	3	11	2	29
Age (in years)	Mean = 66.4 SD = 9.5		Mean = 61.5 SD = 6.6	
Marital Status				
Married	26	96	5	71
Non-married	1	4	2	29
Race				
Caucasian	25	92	6	86
Native American	1	4	0	0
Hispanic	1	4	0	0
Black	0	0	1	14
Employment				
Employed	8	30	4	57
Not Employed	19	70	3	43
Education (in years)	Mean = 13.5 SD = 3.3		Mean = 14.1 SD = 2.5	

The health related behaviors of smoking and eating a diet high in fat were compared. There were no statistically significant differences in the two groups for smoking [$X^2 (1, N = 34) = 3.97, p > .05$] or for a high fat diet [$X^2 (1, N = 34) = 1.12, p > .05$].

Hypothesis Testing

The hypotheses of this study were (1) perceived benefits, barriers, and self-efficacy of individuals who are adherent to an exercise program for a period of 18 to 24 months post cardiac event will differ from those who are non-adherent and (2) perceived benefits, barriers, self-efficacy, and adherence levels will differ between 6 to 8 weeks post cardiac event and 18 to 24 months. To test these hypotheses, the subjects who responded to the second study were divided into two groups: adherent and non-adherent to cardiac exercise, using the score from the Exercise Compliance Questionnaire (ECQ). As stated previously, one subject did not answer the questions necessary to determine adherence. Therefore, a sample size of 34 was used for testing the hypothesis. Using t-tests for independent samples, the two groups were compared regarding perceived benefits, barriers, and self-efficacy. The means and standard deviations of the two groups are shown in Table 4. There were no statistically significant differences in the two groups ($p > .05$), and therefore, the data did not support hypothesis one.

Table 4

Comparison of Perceived Benefits, Barriers, and Self-Efficacy Between Adherent and Non-Adherent Subjects.

Variable	Adherent (n = 27)		Non-adherent (n = 7)		t	df	p
	M	SD	M	SD			
Benefits	44.40	5.04	45.28	4.19	.42	32	.67
Barriers	23.62	5.19	22.28	6.77	.57	32	.57
Self-Efficacy	499.66	57.59	495.14	57.49	.19	32	.85

In comparing perceived benefits, barriers, and self-efficacy over the two time periods, the groups were again divided into adherent and non-adherent. Separate analysis were done for each of the two groups to compare the first measurement (8 to 12 weeks post cardiac event) with those of the second measurement (18 to 24 months post cardiac event). The groups were kept separate to compare how the health beliefs of perceived benefits, barriers, and self-efficacy change over time in relation to adherence.

In the adherent group, t-tests for dependent samples did not show any statistically significant differences in the scores for perceived benefits, barriers, or self-efficacy from the first measurement to the second (See Table 5).

The non-adherent group had similar results when comparing scores for perceived benefits, barriers, and self-efficacy from the first measurement to the second (See Table 5). There was no statistically significant difference in any of the scores. The largest change was seen in the self-efficacy score. The mean self-efficacy score was raised, although this

is not statistically significant ($p > .05$). The t-test results may not be valid due to the small sample size of 7.

Table 5

Comparison of Perceived Benefits, Barriers, and Self-efficacy for Adherent and Non-adherent Groups from 6 to 8 Weeks Post Cardiac Event and 12 to 24 Months Post Cardiac Event.

Variable	Measurement 1 (6 to 8 weeks)		Measurement 2 (12 to 24 months)		t	df	p
	M	SD	M	SD			
Adherent (n = 27)							
Benefits	45.03	4.82	44.40	5.04	.97	26	.34
Barriers	23.55	3.97	23.62	5.19	.09	26	.92
Self-Efficacy	464.96	106.57	499.66	57.59	1.93	26	.07
Non-adherent (n = 7)							
Benefits	42.28	5.73	45.28	4.19	1.28	6	.24
Barriers	25.28	6.60	22.28	6.77	1.00	6	.35
Self-Efficacy	394.85	134.78	495.14	57.49	1.55	6	.17

Additional findings of the study include a comparison of adherence levels over the two time periods. This study can only analyze data from the respondents to the second study for adherence over time. Of the 27 adherent respondents to the second study, 85% (n = 23) were classified as adherent to cardiac exercise at the time of the first study. Fourty Three percent (n = 3) of the non-adherent respondents to the second study were non-adherent at the time of the first study. As stated previously, when comparing the

respondent group to the non-respondents, a large majority of the respondents (77 %, n = 23) were classified as adherent to cardiac exercise during the first study. Overall twenty seven subjects from the original sample were adherent to exercise at eighteen to twenty four months post cardiac event. The adherence rate is 30% for the time period. This rate is slightly lower than the reported rates by Oldrige (1983).

CHAPTER V

DISCUSSION/IMPLICATIONS/LIMITATIONS

Discussion

Why people choose to participate in health behaviors, such as cardiac exercise, has been explored in depth in the literature. The research has shown that participating in health behaviors, such as cardiac exercise, can reduce mortality and reduce risk for recurrent cardiac events. Many variables have been identified as important determinants of health behavior. The HBM has been used to identify key areas that influence a persons decision to participate in health related behaviors. In the study by Foster (1995) the HBM variables of percieved benefits, barriers, and self-efficacy were compared in people adherent and those non-adherent to cardiac exercise post cardiac event. The purpose of this study was to support and expand the findings of Foster (1995) by demonstrating a difference between the health beliefs of individuals adherent to an exercise program and those who were not at two time intervals. The results of the study by Foster (1995) suggested a significant difference in perceived benefits, barriers, and self-efficacy between adherent and non-adherent subjects at a time period of 6 to 8 weeks post cardiac event. The results of the current study did not support the findings of Foster (1995). Health beliefs of adherent and non-adherent groups were not significantly different from each other ($p > .05$). Reasons for this include small sample size and sample bias, and will be discussed in detail in the following paragraphs.

The comparison between the respondents to the current study and the non-respondents identified some significant differences that may have biased the sample.

Foster (1995) identified marital status as a significant difference in adherent and non-adherent subjects. She noted that married subjects were more likely to be adherent to exercise. The comparison of marital status between adherent and non-adherent respondents to the second study did not show a significant difference ($p > .05$). The current study identified that subjects who responded to the second study were more likely to be married ($p < .05$).

The related health behaviors of smoking and eating a diet high in fat were also significantly different between the respondents and non-respondents. The non-respondents were more likely to smoke and eat a diet high in fat ($p < .05$). These health related behaviors may have influence on the sample. The literature supports that health related behaviors are linked to the HBM variables of perceived benefits, barriers, and self-efficacy. Kelly, Zyzanski, and Alemagno (1991) explored six lifestyle areas including; smoking, dealing with stress, amount and type of food eaten, use of seat belts, and exercise habits. The change in lifestyle to include more healthy behaviors was linked to motivation and self-efficacy. This would suggest that a group who continues to engage in behaviors such as smoking and eating a diet high in fat would be different in regards to motivation and self-efficacy than a group who does not.

Another area of bias in the sample was the level of adherence to exercise at the time of the first study. As stated previously, the respondents to the second study were largely the adherent group from the first study. Adherence to cardiac exercise has been linked to several HBM variables. Marlenga (1995) and Tirrell and Hart (1980) identified perceived barriers as the strongest variable related to compliance. The researcher can

speculate that if the respondents to the second study were largely adherent to exercise, this will have influence on their HBM variables of perceived benefits, barriers, and self-efficacy. This combined with the very small sample size of the non-adherent respondent group ($n = 7$) limits interpretation of the data.

The second hypothesis of this study was that perceived benefits, barriers, self-efficacy, and adherence levels will differ from 6 to 8 weeks post cardiac event and 18 to 24 months post cardiac event. The data was unable to support this hypothesis ($p > .05$). The data did show an increase in efficacy score for both the adherent, and non-adherent groups, although not statistically significant ($p > .05$).

One possible explanation for this is again the bias of the sample. The literature supports that the health beliefs of perceived benefits, barriers, and self-efficacy are important factors in adherence of exercise. Since the sample was largely adherent to exercise at the time of the first and second study, it is reasonable to speculate that they needed to maintain a level of perceived benefits, barriers, and self-efficacy to accomplish this. The data can only be interpreted to mean that the level of perceived benefits, barriers, and self-efficacy were not significantly different at the two time periods. This may be an area for further research to explore what levels of perceived benefits, barriers, and self-efficacy are needed to maintain adherence over long periods of time.

The HBM has been used as a conceptual framework for many studies exploring the relationships of health related behaviors and the concepts of perceived benefits, barriers, and self-efficacy. Numerous researchers have supported these relationships. The results of the current study do not support the numerous studies done in the past,

relating the HBM variables with adherence to cardiac exercise. The current study has many areas of sample bias, and a very small sample size of the non-adherent group. The researcher would speculate that the current study has too many areas of weakness to challenge the HBM. Although the results of the current study do not support the HBM, it should not be interpreted that the HBM variables of perceived benefits, barriers, and self-efficacy are not related to adherence to cardiac exercise.

Limitations

This study is very limited by the sample size. The majority of subjects who were non-adherent to exercise at the time of the first study did not respond to the second study. The researcher may speculate that individuals are more likely to respond if they are adherent to exercise. Enlarging of the initial sample size and obtaining consent for an additional measurement in the future, may help this problem. If people agree to two measurements at the start of the study they may be more likely to respond to both measurements.

Sample bias is a limitation to this study. As stated previously, there are several significant differences in the group who responded to the second study and the group who did not respond. Marital status, health related behaviors of smoking, and high fat diet, type of invasive procedure, and adherence level at the time of the first study all may have influenced the results.

The Exercise Compliance Questionnaire only asked questions regarding walking or biking. It is possible some subjects were performing daily activity that was not recorded by this tool. Future work may wish to look at all forms of physical activity.

Mortality and history are two other potential threats to internal validity of this study. The researchers were aware of only a few subjects who died. There may be more subjects who died and the information was not made available to the researcher. History has a large influence on individuals. Sixteen to 22 months had past between the two measurements. In that time the Centers for Disease Control issued a statement on exercise and mortality (CDC, 1996). The president of the United States has publicly been seen exercising regularly. The amount of people enrolled in Health Maintenance Organizations (HMO) has grown. These historical factors impact the community to be more aware of preventative health behaviors, and in many areas requires physicians to address health behaviors on every patient visit.

Convenience sampling is also a limitation to this study. The population was predominantly Caucasian and possessed a high-school education or higher. Results of the study are limited to participants of the study and cannot be generalized to the entire population of cardiac patients. Random sampling procedures with a larger sample size in future research would be beneficial.

Recommendations

The purpose of this study was to look at health beliefs and adherence to cardiac exercise over time. It was hypothesized that health beliefs would be related to adherence at eighteen to twenty four months post cardiac event. The importance of adherence to exercise over long periods of time is very significant in the fight against heart disease. This study was unable to show a statistical difference in the health beliefs of subjects adherent to exercise and those non-adherent to exercise. It is recommended that further

research be done on a population of cardiac patients to measure health beliefs and adherence at varying time intervals. If a researcher uses a large sample size and obtains consent for multiple measurements over several years, it is likely the drop out rate could be reduced. This would allow for more reliable analysis of the data. Analysis looking at what levels of health behaviors are needed to maintain adherence may also be beneficial.

Other related health behaviors, such as smoking and eating a diet high in fat, may be linked to adherence to cardiac exercise. This relationship to cardiac exercise has not been explored in the literature. Future research may wish to explore if health behaviors are linked.

Adherence over long periods of time may be influenced by interventions. This study did not address this. Little research has been done to determine what will keep people adherent to cardiac exercise over long periods of time. It is recommended that future research not only measure adherence over time, but intervene in a controlled setting to determine what will benefit adherence levels over time.

Conclusions

The findings of the current study are limited. The data did not show a significant difference in the health beliefs of adherent and non-adherent subjects. The data also did not show a significant difference in health beliefs of perceived benefits, barriers, and self-efficacy over the two time periods. The many limitations of the study prevent many conclusions from being drawn from the data. Many areas for further research have been identified.

The subjects who maintained adherence to cardiac exercise over the two time

periods did not show a significant difference in health beliefs. The level of adherence for this sample over eighteen to twenty four months was consistent with previous literature. This is an important area for further exploration. Research to identify how levels of health beliefs relate to levels of adherence over time, may lead to specific ways of predicting adherence, and planning timing of interventions.

Nurses and other health professionals can provide patient with the knowledge and support necessary to start and maintain regular cardiac exercise. Assisting patients to identify benefits and barriers to exercise can help in designing a plan to incorporate exercise into a lifestyle that the patient agrees with and believes he/she can carry out. Measuring adherence and health beliefs at varying time intervals can provide health care workers with the information needed to intervene, and support adherence to exercise over long periods of time.

Appendix A

I.D. NO: _____

Cardiac Exercise Health Belief Scale

This is a questionnaire designed to determine the way in which different people view certain issues related to exercise and heart disease. The questionnaire includes belief statements with which you may agree or disagree. Read each statement carefully, then CIRCLE the letter(s) to the left of the item which most closely represents your personal beliefs. This is a measure of your personal beliefs. There are no right or wrong answers.

The letter(s) to the left of each statement stand for the following responses:

SD Strongly Disagree
D Disagree
N Neutral
A Agree
SA Strongly Agree

In this questionnaire:

HEART DISEASE includes any of the following: myocardial infarction (heart attack), angina (chest pain with exertion), and coronary artery bypass graft (CABG).

CARDIOVASCULAR EXERCISE is exercise that keeps your heart rate raised for twenty to thirty minutes and is performed three to four times a week.

EXERCISE when used in this questionnaire means cardiovascular exercise.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
SD	D	N	A	SA	
SD	D	N	A	SA	1. I feel exercising regularly will strengthen my heart muscle.
SD	D	N	A	SA	2. Exercising regularly helps to keep my arteries open.
SD	D	N	A	SA	3. I feel exercising regularly is vital for my health.
SD	D	N	A	SA	4. Exercising regularly reduces my risk of another heart problem.
SD	D	N	A	SA	5. I can slow the progression of my heart disease by exercising regularly.
SD	D	N	A	SA	6. When I exercise regularly I feel good about myself.
SD	D	N	A	SA	7. Exercising regularly reduces my risk of future heart problems by helping me control stress.
SD	D	N	A	SA	8. Exercising regularly reduces my risk of future heart problems by helping me lose weight.
SD	D	N	A	SA	9. I feel better when I exercise regularly.
SD	D	N	A	SA	10. My family feels my exercise program is important in reducing my risk of future heart problems.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
SD	D	N	A	SA	11. I am not strong enough to exercise regularly.
SD	D	N	A	SA	12. Exercising regularly can be time consuming.
SD	D	N	A	SA	13. Exercising regularly requires starting a new habit which is difficult.
SD	D	N	A	SA	14. I dislike exercising regularly.
SD	D	N	A	SA	15. There is no place for me to exercise regularly.
SD	D	N	A	SA	16. I am too busy to exercise regularly.
SD	D	N	A	SA	17. I dislike exercising regularly because it makes me sweat.
SD	D	N	A	SA	18. I am afraid I will have symptoms such as chest pain or shortness of breath if I exercise regularly.
SD	D	N	A	SA	19. Exercising regularly interferes with other activities I need to do.
SD	D	N	A	SA	20. I don't have anyone to exercise regularly with me.
SD	D	N	A	SA	21. My family and friends think I am foolish to exercise regularly since I had my heart problem.

5/13/94

G. McGinn, M. Foster

Appendix B

I.D. NO: _____

Exercise Compliance Questionnaire

The following eight questions relate to the prescribed home exercise program outlined by the physical therapist before you were discharged from the hospital. Please look over each question carefully and respond by placing a check mark by one of the five possible responses that **BEST** describes how you exercise. Please **CHECK ONLY ONE RESPONSE** to each question. If you have stopped exercising, please answer the question **FOR NON-EXERCISERS ONLY**. Thank-you.

1. How many times do you exercise (walk and/or bike) each week?

- _____ 1. Fewer than 3 times a week
- _____ 2. 3 times a week
- _____ 3. 4 times a week
- _____ 4. 5 times a week
- _____ 5. More than 5 times a week

2. When you exercise (walk and/or bike), how long does this specific activity take you?

- _____ 1. Less than 20 minutes
- _____ 2. 20 to 29 minutes
- _____ 3. 30 to 39 minutes
- _____ 4. 40 to 49 minutes
- _____ 5. 50 minutes or more

If you **WALK ONLY**, answer question #3. If you **BIKE ONLY**, answer question #4.
If you **BOTH WALK AND BIKE**, answer questions #3 AND #4.

3. **WALKERS** - When you walk for exercise, approximately how fast do you go in miles per hour (mph)?

- _____ 1. Less than 2 mph
- _____ 2. 2 to 2.9 mph
- _____ 3. 3 to 3.9 mph
- _____ 4. 4 mph
- _____ 5. More than 4 mph

4. **BIKERS** - When you bike for exercise, approximately how fast do you go in miles per hour (mph)?

- _____ 1. Less than 5 mph
- _____ 2. 5 to 5.9 mph
- _____ 3. 6 to 7.9 mph
- _____ 4. 8 mph
- _____ 5. More than 8 mph

5. When you exercise, how often do you take your pulse before you warm up?

- _____ 1. Never
- _____ 2. Occasionally
- _____ 3. Sometimes
- _____ 4. Most of the time
- _____ 5. Always

6. How often do you take your pulse after you cool down from exercise?

- _____ 1. Never
- _____ 2. Occasionally
- _____ 3. Sometimes
- _____ 4. Most of the time
- _____ 5. Always

7. Did you exercise before your heart attack?

- _____ 1. No
- _____ 2. Yes, occasionally
- _____ 3. Yes, 1 to 2 times a week
- _____ 4. Yes, 3 to 4 times a week
- _____ 5. Yes, more than 4 times a week

FOR NON-EXERCISERS ONLY

8. Did you ever start the exercise program recommended to you in the hospital?

_____ (1) Yes _____ (2) No

IF YES, please state:

Date you stopped exercising: _____

Reason for stopping exercising: _____

Modified from Radtke, K. L. (1989). Exercise compliance in cardiac rehabilitation. Rehabilitation Nursing, 14, 182-186.

Appendix C

I.D.NO: _____

CARDIAC EXERCISE S-E SCALE

We are interested in learning how confident you feel about doing the following activities. Everyone has different experiences which will make each person more or less confident in doing the following things. Thus, there are no right or wrong answers to this questionnaire. It is your opinion that is important. In this questionnaire, EXERCISE means activity that keeps your heart rate raised for twenty to thirty minutes and is performed three to four times per week.

Place your "X" anywhere on the answer line that you feel best describes your confidence level.

If it is recommended that you do any of the following THIS WEEK, how confident or certain would you be that you could:

1. begin a new or different exercise program

Not at all _____ Very
confident confident

2. put forth the effort required to exercise

Not at all _____ Very
confident confident

3. change your exercise habits

Not at all _____ Very
confident confident

4. do exercises even if they are difficult

Not at all _____ Very
confident confident

5. exercise for the appropriate length of time

Not at all _____ Very
confident confident

6. do the type of exercises that you are supposed to do

Not at all _____ Very
confident confident

Modified from Osteoporosis S-E Scale. Horan, M., Kim, K., & Gendler, P. (1993).
Development and evaluation of the Osteoporosis Self Efficacy Scale. A paper
presented at the Midwest Nursing Research Society Conference, Cleveland, OH.

Appendix D

I.D. NO.

DEMOGRAPHIC QUESTIONNAIRE

The following personal information is needed for our data analysis. This information is completely confidential. For each question, choose only ONE answer unless otherwise indicated.

1. What is your present age in years? _____ years
2. What is your sex?
☐ 1. male ☐ 2. female
3. What is your present marital status?
☐ 1. single
☐ 2. married
☐ 3. divorced
☐ 4. separated
☐ 5. widowed
4. Are you presently employed? ☐ 1. yes ☐ 2. no
5. If employed, do you work ☐ 1. full-time ☐ 2. part-time
6. What is (or was) your occupation? _____
(please specify)
7. What is your average household annual income?

<input type="checkbox"/> 1. less than \$10,000	<input type="checkbox"/> 5. \$40,001 - 50,000
<input type="checkbox"/> 2. \$10,001 - 20,000	<input type="checkbox"/> 6. \$50,001 - 60,000
<input type="checkbox"/> 3. \$20,001 - 30,000	<input type="checkbox"/> 7. Greater than \$60,000
<input type="checkbox"/> 4. \$30,001 - 40,000	

8. What is the highest grade or year of school you have completed?

years completed PLEASE CIRCLE

none	00
Elementary	01 02 03 04 05 06 07 08
High school	09 10 11 12
College/technical school	13 14 15 16
Some graduate school	17
Graduate or professional degree	18

9. Which of the following personal behaviors or characteristics apply to you?

- ☐ 1. smoking
- ☐ 2. use a lot of table salt
- ☐ 3. eat a diet high in fat
- ☐ 4. overweight
- ☐ 5. under a lot of stress

10. What race do you consider yourself to be?

- ☐ 1. Asian
- ☐ 2. Black
- ☐ 3. Caucasian
- ☐ 4. Hispanic
- ☐ 5. Native American
- ☐ 6. Other _____

(please specify)

11. Do you have health insurance?

- ☐ 1. yes
- ☐ 2. no

12. What type(s) of cardiac event(s) have you had? Check all that apply:

- ☐ Myocardial Infarction (heart attack)
- ☐ Coronary artery bypass surgery (open heart surgery)
- ☐ Balloon angioplasty

13. Do you have any physical limitations which prevent you from participating in CARDIOVASCULAR exercise. Cardiovascular exercise is exercise that keeps your heart rate raised for twenty to thirty minutes and is performed three to four times per week.

- ☐ 1. yes
- ☐ 2. no

If yes, please describe your physical limitations

14. Do you have regular contact with a health care provider?

- ☐ 1. yes
- ☐ 2. no

Appendix E

Dear _____,

You were a participant in a study that looked at patients perceptions or beliefs about benefits and barriers to performing a recommended exercise program after discharge from the hospital, about two years ago. I would like to thank you again for your participation at that time. Through that study we were able to gain some insight into the health beliefs of people who participate in cardiac exercise and those who do not. The results of this study were very significant in identifying differences in people who participated in cardiac exercise and those who did not. It is only from people like you that we can gain this insight.

The original study gave us a view at one point in time, but as you know things change over time. I would like to look at your perceptions of benefits and barriers to cardiac exercise using the same questionnaires at a point in time 18 to 24 months following your cardiac event. You are under no obligation to participate in this follow up study. Participation is completely voluntary.

I hope the information gained will help health care workers to be better able to remove barriers and increase patients understanding of the benefits of exercise over long periods of time. There is no negative risk to anyone who participates in this study.

If you wish to participate in this follow up study, please sign the enclosed consent form, then complete the enclosed questionnaires and return them in the stamped, addressed envelope provided. This will take you about 20 to 30 minutes to complete. All responses will be kept totally confidential. The information is identifiable by number only. At no time is your name attached to your responses. Your responses are not shared with your physicians or your family. You may have a copy of the completed research if you wish.

I would like to introduce you to Vince Worthington RN, he will be the co-investigator on this follow up study. He will be happy to answer any questions you may have. Feel free to contact him at (616) 935-6446 (days) or (616) 938-9598 (evenings).

Thank you again for your past participation and in advance for your future participation.

Sincerely,

Marianne Foster
Vince Worthington

Appendix F

Information and Informed Consent for Research Project Participants

The purpose of the study in which you are being asked to participate is to examine the relationship of health beliefs of individuals with heart disease and how they take care of themselves. The results of this study will help test the assessment tool that may be helpful in early identification of problems related to an individual adopting a regular exercise program following the onset of angina, a heart attack, or heart surgery.

This research is being conducted by Marianne Foster R.N. / Vince Worthington R.N., as course work in completion of a master of science degree in nursing through Grand Valley State University. Any questions can be directed to Vince Worthington at (616) 935-5446 (days) or (616) 938-9598 (evenings) or to Professor Paul Huizenga, Human Research Review Committee, Grand Valley State University (616) 895-2472.

As a participant, I understand I will be asked to complete the questionnaires sent to me in the mail, eighteen to twenty four months following my cardiac event. I understand that the questionnaires will take 15 to 30 minutes to complete. I will be provided with directions. It is not anticipated that participation will result in any physical, psychological or economic risk. I understand I will receive no direct benefit as a result of participation. I understand that my participation is voluntary and I may withdraw from the study at anytime.

I understand that every effort will be made to protect my confidentiality. The information is identifiable by number only. At no time is my name attached to my responses. My responses are not shared with my physicians or family. The results of the study will be made available to me on my request to the researcher.

I have read and understand the information presented. I consent, of my free will, to participate in this study.

Participant Signature

Date

Appendix G



802 Michigan Avenue
Holland, Michigan 49423-4999
(616) 332-5141

March 27, 1996

Vince Worthington, RN, MSN
Clinical Nurse Specialist
Munson Medical Center
1105 Sixth Street
Traverse City, MI 49684-2386

Subject: IRC Approval of Research Study, "The Relationship of Health Beliefs to Cardiac Exercise"

Dear Vince:

Thank you for sending us your revised cover letter and informed consent. Copies of these documents were sent to all Institutional Review Committee members for their review. All members agreed that your revisions are in compliance with the committee's request.

The contingency items mentioned in my first letter to you have been met, and full approval of the study was awarded to you on February 12, 1996. I understand that you have begun the study based on our verbal approval, but I wanted to send it in writing for your record as well as ours.

I hope the study is going well and look forward to reviewing the results.

Sincerely,

Reszie DeVet, RN
Corporate Vice President, Clinical Integration and CNO

cp

C Judy Javorek
IRC File

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