

Exercise Self-Efficacy, Habitual Physical Activity, and Fear of Falling in Patients with Coronary Heart Disease

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ABSTRACT

The purpose of this study was to determine if a relationship exists between self-efficacy for physical activity and other pertinent factors in patients with coronary heart disease (CHD). A secondary purpose of this study was to determine if self-efficacy and exercise behavior are different in patients who report a fearing of falling (fallers) as compared to patients who do not report a fear of falling (non-fallers). This study included 50 patients who were admitted to the hospital for a CHD related diagnosis. Patients completed assessments of cardiac self-efficacy (Modified Barnason Efficacy Expectation Scale) and exercise behavior self-efficacy (Self Efficacy for Exercise Behavior Scale). In addition, the Physical Function subscale of the RAND 36-Item Health Survey and the Telephone Interview of Cognitive Function were used to characterize physical and cognitive function, respectively. Data analysis consisted of descriptive statistics, correlations, t-tests, and chi-square. Older patients reported higher levels of cardiac self-efficacy. Further, a positive correlation was found between cardiac self-efficacy and pre-hospitalization level of physical function. Patient income level and Self-efficacy for Exercise Behavior Resisting Relapse subscale scores were significantly correlated. A higher percent of fallers failed to meet minimum exercise guidelines as compared to non-fallers. It is important to identify the factors that are associated with exercise self-efficacy to improve health behavior adoption and adherence in patients with CHD.

Key Words: coronary heart disease, self-efficacy, exercise, cardiac rehabilitation

INTRODUCTION

Purposeful exercise and increased habitual physical activity are important lifestyle components for patients with coronary heart disease (CHD). These behaviors have many benefits for patients with CHD including increased aerobic capacity, quality of life, anginal threshold, and ability to carry out daily activities and live independently. Exercise is also important in the secondary prevention of CHD. Current recommendations suggest that a comprehensive exer-

cise program, including aerobic, flexibility, and strength training components, is most beneficial for patients with CHD.^{1,2} Many factors influence patients' ability to engage in exercise such as lack of time, fear of injury, and considering it unimportant.^{3,4} To assist a patient in successfully implementing and maintaining an exercise program to reduce cardiac mortality and morbidity, health care professionals need to consider many individual factors including learning preferences and barriers, access to and competence with equipment, current level of knowledge, and attitudes about, barriers to, and self-efficacy for exercise.⁵⁻⁷

Participation in outpatient cardiac rehabilitation (CR) is sometimes a viable option for patients with CHD to facilitate adoption of exercise, but disappointingly, is not universally embraced by all eligible patients or referring physicians.⁸ Fewer than half of all patients who are eligible for outpatient CR programs actually enroll after being discharged from acute care hospitals.^{9,10} Many patients do not attend CR because they have negative perceptions of their control over health. Still others do not attend due to financial constraints imposed by inadequate health insurance and inability to pay for such services.^{11,12} Limited accessibility (transportation, distance, winter weather) to outpatient CR services may also restrict many patients from participating in organized exercise sessions after hospital discharge.^{13,14} Other important factors that prevent enrollment in an outpatient CR program are return to work and lack of physician referral.¹

Despite the benefits, many patients with CHD do not adhere to regular participation in CR or unsupervised exercise programs because they have low self-efficacy for participation in and adherence to a program of regular exercise.^{15,16} Self-efficacy is a cognitive mechanism that mediates behavior change, influences participation in various activities, and determines the amount of effort and degree of persistence in pursuing the activity despite aversive stimuli. Self-efficacy is defined as an individual's judgment of their capability to organize and execute actions needed to perform an activity, and is largely influenced by past performance and accomplishments, or mastery experiences.¹⁷ Oka et al¹⁸ found that self-efficacy was the strongest mediating influence on physical activity level, and a better predictor of physical activity than peak oxygen consumption or perceived exertion during physical activity. According to Bandura,¹⁷ if people lack the self-efficacy for a behavior, they will likely behave ineffectually, even if they know what to do and how to do it. For example, older women (n = 32)

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with heart failure who participated in a 12-week, home-based, self-monitored, low- to moderate-intensity walking program showed improved self-efficacy for exercise, in addition to 6-minute walk distance, depressive symptoms, and quality of life as compared to a non-exercising control group.¹⁹ Previous studies suggest that a strong relationship exists between self-efficacy and exercise behavior, functional status, quality of life, and social support in patients with CHD.¹⁸⁻²⁴ Structured exercise programs need to emphasize educational and patient monitoring methods that promote patient self-efficacy for independent exercise because highly supervised programs may impair self-efficacy for independent exercise.²⁵ In a randomized study, Carlson et al^{25,26} found that low-to-moderate risk patients with CHD who participated in modified CR that provided strategies for transition to independent exercise (3 sessions per week, 4 weeks; tapering directly supervised sessions for 20 weeks) had higher levels of exercise self-efficacy and adherence than those who participated in traditional CR (3 sessions per week, 3 months, continuous ECG monitoring). Many factors intertwine to contribute to a sense of self-efficacy regarding a specific behavior.¹⁷ Therefore, it is important to understand factors that may influence self-efficacy for exercise in patients with CHD.

Previous falls and/or loss of balance, and the subsequent fear of falling, may contribute to real or self-imposed activity restriction and sedentary behavior. In 2006, Stretton et al²⁷ conducted a study to assess the relationships between physical function, self-efficacy, and health-related quality of life. Their study included 243 subjects who were assessed using 3 performance-based measures of physical function (Timed Up and Go Test, Gait Speed, and Berg Balance Scale), and 5 self-report measures, including the Modified Falls Self-efficacy Scale, at 3 and 6 months. They found that falls self-efficacy was the single highest predictor of physical function. Kressig and colleagues²⁸ found significant relationships between fear of falling and multiple performance-based measures of function in 287 subjects 70 years of age and older who were transitioning to frailty. Interestingly, Kressig et al²⁸ did not find an association between activity-related fear of falling and age in this sample of older adults. Recently, Gillespie and Freidman found that 76% of older adults who reported fear of falling modified their activity level secondary to this fear.²⁹

Little is known about the relationships between exercise self-efficacy and age, socioeconomic status, prior physical function, cognition, and fear of falling in patients with CHD. Therefore, the purpose of our study was to determine if a relationship exists between exercise and cardiac self-efficacy in relation to demographics, cognitive function, or prior physical function in patients with CHD. A secondary purpose of this study was to determine if self-efficacy and exercise behavior are different in patients who report a fear of falling (fallers) as compared to patients who do not report a fear of falling (non-fallers).

METHODS

Subjects

Study participants (n = 50) were volunteers prospectively recruited from Sacred Heart Medical Center, a re-

gional medical center in the northwestern United States. Prior to study participation, patients were screened for inclusion and exclusion criteria. The study inclusion criteria were hospital admission due to a CHD-related diagnosis, ability to follow directions, ability to understand English, and emotionally stable. Exclusion criteria included cardiac transplantation or ventricular assist device placement, cardiac arrhythmia or heart failure without concurrent diagnosis of CHD, isolation precautions in place, and/or cognitive deficit (< Level 6 on Rancho Los Amigos Level of Cognitive Functioning Scale).

Procedures

Volunteers meeting study criteria were first provided an informed consent document, which was approved by St. Luke's Rehabilitation Institute's Institutional Review Board, to read and sign. Pertinent background demographic and medical information was obtained via chart review and history taking. Information used in data analysis included age, body mass index, income, education level, fear of falling, and exercise habits. Fear of falling was scored as nominal data (yes or no) and determined by an affirmative answer to 1 or more of 3 questions which were:

1. Are you afraid of falling?
2. Do you limit any household activities because you are worried you may fall?
3. Do you limit any outside activities because you are worried you may fall?

Meeting minimum exercise guidelines was scored as nominal data (yes or no) and determined by report of 30 minutes or more of activity that elevated heart rate on at least 3 days per week.

Data collection involved completion of a packet of self-report questionnaires and administration of the Telephone Interview of Cognitive Status by a study investigator. The time to complete the self-report questionnaires was not restricted, and the order was randomly determined. The self-report measures used in the study included the Barnason Efficacy Expectation Scale, the Self-Efficacy for Exercise Behavior Scale, and the Physical Function subscale of the RAND 36-Item Health Survey. All data collection took place during the patient's hospital admission in his or her room during a single session lasting approximately 1 hour. The instruments used in this study will be briefly described.

Instruments

The *Telephone Interview for Cognition Status* is a brief interview assessment of cognitive function that can be administered in person or over the telephone. It is more sensitive to subtle changes and shorter than other instruments.³⁰ The scale consists of 39 items rated on a nominal scale creating a range of 0-39, with higher scores indicating better cognitive function. In older adults, the Telephone Interview for Cognition Status was highly correlated with the Mini Mental State Exam ($r = 0.57$), and the Cambridge Cognitive Examination ($r = 0.62$), which are more widely used tests of cognition.³⁰ Furthermore, this instrument was able to differentiate patients with Alzheimer's disease from

healthy controls.³¹ Crooks et al³² compared the Telephone Interview for Cognitive Status to the criterion measurement of cognitive impairment (in-person clinical assessment) and found that this instrument was able to identify people with dementia and cognitive impairment (kappa = 0.89). The threshold value for diagnosing dementia using the Telephone Interview for Cognitive Status is < 15.³³ This instrument has been previously used to evaluate patients who had undergone CAB surgery and was sensitive to differences between groups in cognitive function.³⁴

The *Self-Efficacy for Exercise Behavior Scale* is an instrument that was developed to evaluate self-efficacy for exercise behavior adoption and maintenance in a wide range of populations. It is comprised of 2 subcategories, Self-Efficacy for Resting Relapse, which contains 5 items, and Self-Efficacy for Making Time, which contains 6 items. Each item on the Self-Efficacy for Exercise Behavior Scale elicits perceived self-efficacy by asking how confident the respondent is that he could exercise under specific circumstances using a 5-point ordinal scale (0 = Not sure I could do it, 5 = Sure I could do it). Percentage scores are calculated and higher scores indicate better self-efficacy than lower scores. Scores less than 70% on the Self-Efficacy for Exercise Behavior Scale are purported to be associated with drop out behavior.³⁵

The *Barnason Efficacy Expectation Scale* is a 15-item instrument developed to measure self-efficacy for return to activity and adoption of secondary prevention behaviors in patients recovering from coronary artery bypass surgery. In this study, a subset of 8 items from the Barnason Efficacy Expectation Scale was used. These 8 items were not specific to recovery from surgery, and were related directly to physical activity. Each item on the scale included a positively worded statement, which was rated on a 4-point ordinal scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). Scores on each item were summed to create a total score that ranged from 8-32, with lower scores indicating low self-efficacy, and higher scores indicating strong self-efficacy for resumption of physical activity.³⁶

The *RAND 36-Item Health Survey* (RAND 36-IHS) and its equivalent, the Short Form 36 (SF-36) are self-report measures of health-related quality of life. These instruments were developed as part of the Medical Outcomes Study, a 4-year observational study that included over 2,500 patients. The RAND 36-IHS consists of 36 items and generates 8 subscales.³⁷ The 10 item Physical Function subscale was used in this study. Scores on the RAND 36-IHS are converted to a percent score, with higher values indicating greater health status. This instrument has been used extensively to study generic health-related quality of life in patients with cardiac problems.³⁸ In addition, measurements obtained with these instruments have well documented degrees of reliability, validity, and sensitivity.³⁹

Data Analysis

Descriptive statistics for study participant demographic data and all study measurements were calculated. A correlational matrix was generated using Pearson Product Correlations for all study variables (cognitive function, physical

function, age, body mass index, income, education level, exercise self-efficacy, and cardiac self-efficacy). Based on the dichotomized data regarding fear of falling, study participants were divided into 2 groups for analysis, those who reported a fear of falling (fallers) and those who did not (non-fallers). We used t-tests to determine if there were differences in the study variables between these groups of subjects. Chi Square analysis was used to determine if differences in frequency were found between study participants categorized as fallers vs. non-fallers. The alpha level was set at 0.05.

RESULTS

A majority of the study participants were men (66%) and retired (65%). Table 1 provides descriptive data on the study participants. Descriptive statistics were calculated for the Self-Efficacy for Exercise Behavior instrument, and for both of the subcategories. Participant scores on the full instrument were (Mean ± SD) 55 ± 24%, with a range of 2-100%. Participant scores on the Self-Efficacy for Exercise Behavior Scale, Resisting Relapse subcategory, were 60 ± 25%, with a range of 5-100%. Participant scores on the Self-Efficacy for Exercise Behavior Scale, Making Time subcategory, were 52 ± 25%, with a range of 0-100%. Descriptive statistics for the Barnason Efficacy Expectation Scale were 25 ± 4, with a range of 17-32.

Table 1. Study Participants' Demographic Data

Variable	Mean (± SD)	Range	Frequency (%)
Age (years)	65 ± 1.6	37 - 94	
BMI (kg/m ²)	31 ± 1	20 - 48	
Physical Function (%)	42 ± 4	0 - 100	
Cognitive Function	22 ± 0.7	12 - 33	
Annual Income			
< \$19,000			21
\$19,000 - 32,000			16
\$32,000 - \$51,000			28
\$51,000 - 64,000			16
\$64,000 - 77,000			7
\$77,000 - 100,000			5
> \$100,000			7
Highest Level of Education			
Junior High School (8 th Grade)			6
High School Graduate			50
Technical / Vocational School			20
Bachelor's Degree			14
Graduate Degree			10
Admitting Diagnosis			
Coronary Heart Disease			100
Coronary Artery Bypass Surgery			16
Cardiac Valve Surgery			10
Arrhythmia			14
Heart Failure			4
Aortic Aneurysm			4

Correlations for scores between study variables are presented in Table 2. The Self-Efficacy for Exercise Behavior Scale Resisting Relapse subscore was positively correlated with income level. The Barnason Efficacy Expectation Scale score was positively correlated with age and RAND 36-IHS Physical Function subscale score. No other significant correlations were found between measurements.

When comparing subgroups of study participants (see Table 3), no differences were found between fallers (n=20) and non-fallers (n=30) on any of the measurement scores. However, a significantly lower percentage of fallers (25%) met minimum exercise guidelines as compared to non-fallers (57%).

DISCUSSION

Subject mean scores on the Self-Efficacy for Exercise Behavior Scale were less than 70% suggesting that study participants had an increased risk for exercise drop out. Since this instrument was developed using a sample of adults from the general population, these results are not surprising.³⁵ Patients with CHD are in poorer health than their age or gender mates in the general population, and often have additional co-morbidities. People with CHD also have an increased incidence of depression compared to the general population. We postulate that making the time and expending the energy to build exercise into one's daily routine is difficult for healthy adults, and possibly even more so for those with CHD who have a limited energy reserve

due to impaired cardiac function. Sarkar and colleagues⁴⁰ found that lower cardiac self-efficacy was associated with greater symptom impact, more impaired physical function, lower quality of life, and lower health status in patients with CHD.

The correlation between exercise self-efficacy for resisting relapse and income suggests that patients with higher income were more confident in adhering to exercise, even when barriers were present. This finding may be due to several factors, including that people with higher income have more time and resources available to support and maintain exercise behavior, even when external factors like household chores, work requirements and/or social obligations are present. These findings are consistent with those of Clark et al,⁴¹ who found that exercise self-efficacy is positively correlated with income. It is also possible that individuals with higher income levels have less physically demanding jobs, resulting in less fatigue at the end of the work day, and therefore more energy to engage in exercise. However, the majority of study participants were retired, so it would be important to consider the relationship between physical work demands and adherence to exercise in a population of adults with CHD who are in the workforce.

Study findings also suggest that participants with higher physical function were more confident returning to physical activity and managing any cardiac-related symptoms experienced. Patients with lower physical function may have a limited repertoire of physical activities in which to

Table 2. Correlations (R) Between Self-Efficacy Measurement Scores and Other Variables

Variable	Self-efficacy for Exercise Behavior Scale – Resisting Relapse	Self-efficacy for Exercise Behavior Scale – Making Time	Barnason Efficacy Expectation Scale
Age	- 0.13	0.08	0.27*
Income	0.26*	0.14	0.01
Education	0.04	0.01	0.17
Body Mass Index	0.15	- 0.11	0.15
Physical Function	0.16	0.18	0.25*
Cognitive Function	0.08	0.02	0.03
*P<0.05			

Table 3. Mean And Standard Deviation Scores for Fallers and Non-fallers

Variable	Fallers (n = 19)	Non-fallers (n=31)
Self-efficacy for Exercise Behavior Scale – Resisting Relapse (%)	60 ± 26	60 ± 24
Self-efficacy for Exercise Behavior Scale – Making Time (%)	61 ± 30	63 ± 30
Barnason Efficacy Expectation Scale	72 ± 19	70 ± 17
Physical Function (%)	37 ± 32	46 ± 29
Meeting Minimum Exercise guidelines	25%	57%*
*P<0.05		

engage, and may be less likely to independently engage in previous physical activities after a cardiac event. This notion is easily conceivable and very well supported by previous research in a variety of patient populations.⁴²⁻⁴⁵ However, people with low physical function might actually have the greatest gains in self-efficacy after engaging in physical activity. Interestingly, less fit, sedentary, and older individuals have been shown to achieve greater improvements in exercise self-efficacy following an exercise trial when compared to younger, more fit individuals, regardless of the intensity of the exercise bout (55% vs. 70% maximum oxygen consumption).^{46,47}

Study results also indicate that older participants were more confident in their ability to return to physical activity and manage potential symptoms. It is possible that age brings experience in coping with health problems, and that in turn, those coping skills would better prepare older adults to engage in physical activity. Life experience and coping skills may help increase a patient's confidence about engaging in exercise safely, or when to contact his or her physician, for example. In a previous study, older patients recovering from coronary artery bypass surgery reported less decline in activities of daily living ability and health-related quality of life than younger patients despite more comorbidities and lower health status.⁴⁸ In our study patients admitted for initial diagnosis of CHD and those admitted for exacerbation of previously diagnosed CHD were not differentiated. Another plausible explanation for the positive relationship between age and cardiac self-efficacy is that as age increases most likely so does the length of time since initial diagnosis of CHD. Over time patients may acquire self-management skills for exercise participation despite experiencing symptoms related to CHD or other chronic conditions.^{49,50}

Our results illustrate that less than 60% of study participants met minimum exercise guidelines prior to hospital admission. These results show that participants were not exercising as much as they should be, especially considering the importance of exercise in light of their CHD. Our definition was more conservative than the current recommendation that individuals accumulate at least 30 minutes of moderate intensity physical activity 5 days per week to reduce disease risk.^{51,52} Despite these recommendations, only about 15% of adults in the United States engage in regular physical exercise,⁵³ and of those who begin an exercise program, 50% will drop out within 3 to 6 months.⁵⁴

In addition, results illustrate that 57% of non-fallers met minimum exercise guidelines, while only 25% of fallers met such guidelines. The significant difference between these groups in meeting minimum exercise guidelines suggests that previous falls and/or loss of balance, and the subsequent fear of falling, may contribute to real or self-imposed activity restriction and sedentary behavior. Previous studies have demonstrated a relationship between balance/fear of falling and physical activity.^{27,29} The relationships between physical function, confidence in ability to return to physical activity, and fear of falling clearly exist, and warrant further investigation.

Our research has assisted in identifying correlations between age, income, physical function, and components of

self-efficacy for exercise. Bandura's¹⁷ social cognitive theory suggests that self-efficacy can be increased in 4 principle ways: mastery experiences, social modeling, persuasion, and reducing negative reactions. Future investigation of the specific factors influencing exercise self-efficacy in patients with CHD is important, and will enable health care professionals to implement strategies to improve self-efficacy in concert with Bandura's theory. By breaking down barriers to adopting exercise and habitual physical activity, health care professionals can promote wellness and secondary prevention in this patient population so in need of improved health. Possibly by indentifying patients with low exercise self-efficacy and low habitual physical activity prior to hospital discharge; interventions can be implemented for those individuals most at risk for sedentary behaviors. With rationing of health care resources it is important to determine who would benefit most and from what type of rehabilitation services.

Several factors must be considered when interpreting the results of this study. This was a cross-sectional study and therefore results cannot be extrapolated to describe the evolution of change in exercise and activity self-efficacy in patients with CHD. For example, some study participants may have been recently diagnosed with CHD, while others may have already received the benefits of cardiac rehabilitation prior to this hospital admission. In addition, since the participants in this study were hospitalized, their medical acuity may have artificially altered their self-efficacy scores. It is possible that during hospitalization a patient with CHD may become recommitted to exercise behaviors due to his current medical event. It is equally plausible that a patient hospitalized for CHD may feel her health is worse than previously thought and therefore have low self-confidence for physical activity. Additionally, the patients with CHD in this study may represent a biased sample, since only patients who elected to volunteer for participation could be included in data collection. Lastly, it is important to note that although several correlations were found to be significant, their values indicate only a moderate relationship ($r < 0.50$) between variables.

CONCLUSION

Study results suggest that patients with CHD are at risk for exercise drop out, and many fail to meet minimum exercise guidelines. Further, patients with higher income may have more resources to support their exercise adherence. Patients with lower physical function are less likely to independently engage in previous physical activities after a cardiac event compared to those with higher physical function. Results also may indicate that age brings experience and possibly confidence in coping with physical impairments. The majority of fallers failed to meet minimum exercise guidelines, indicating that fear of falling may contribute to activity restriction. It is important to identify factors that are associated with exercise self-efficacy. While multiple factors may contribute to higher or lower self-efficacy within a specific patient population, strategies to increase self-efficacy and patients' participation in their own care should be implemented.

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