# FACTORS PREDICTING PHYSICAL ACTIVITY AFTER HOSPITALIZATION AMONG NEW CORONARY ARTERY DISEASE PATIENTS

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**ABSTRACT:**

Physical activity (PA) has been shown to be beneficial for patients with cardiovascular disease (CVD), but some studies showed that many patients do not enhance their PA after hospital discharge. A cross-sectional study was conducted to investigate PA and to identify the predictive factors of PA among new coronary artery disease (CAD) patients. Participants were recruited from 10 tertiary hospitals, selected by proportional randomized sampling of all regions of Thailand. Data were collected by using self-reported questionnaires, i.e. demographic, symptom frequency and symptom distress scale (SFSDS), subjective PA experiences scale (SPAES), family and friend support for PA scale (FFSPAS), self-efficacy for PA scale (SEPAS), and international PA long form (IPAQ_L form). Data were analyzed by descriptive and inferential statistics, i.e. range, median, interquartile range (IQR), and the LISREL with robust maximum likelihood estimation. The results revealed that among 160 participants recruited. Most of them were males (63.75%), aged between 50-69 years (63.75%), and lived with their family (94.37%). Work domain was the highest PA intensity (median = 1,813, IQR = 5,202 MET-min/wk.). Seventy-three percent and 30.00% performed moderate and vigorous activity intensity with a median of 1,920 (IQR = 3,385), and 900 (IQR = 2,880) MET-min/wk., respectively. Five of eight variables – age (r = -.21; P<.01), self-efficacy (r = .33; p<.01), gender (r = .18; p<.05), education (r = -.18; p<.05), and symptom distress (r = -.16; p<.05) – had a significant correlation to PA, while comorbidity, subjective experiences, and support from family and friend did not (r = .04, -.15, and -.08, respectively). In addition, the numbers of participants engaging in PA before and after hospitalization were similar (55.63% VS. 56.25%). PA enhancing programs like walking activities can be suggested

**Keywords:** Physical activity, Coronary artery disease patients, After hospitalization

## INTRODUCTION

Physical activity (PA) is defined as any bodily movement produced by skeletal muscle which results in energy expenditure [1]. PA in daily life can be categorized into recreational or leisure-time, transportation, occupation, household chores, playing games, sports and planned exercise, and can be described by three aspects – frequency, duration, and intensity [2].

In CVD patients, the benefits of PA have been well-established. Regular PA among CAD patients could improve the endothelial function [3], increase circulatory function [4] and reduce risk of CVD [5].

PA and exercise training delay the development of atherosclerosis and reduce the incidence of coronary heart disease events [6], prevent the restenosis of coronary arteries [7], and reduce the mortality rate of CVD [8, 9].

The recommendation stated that people with established CVD should aim to achieve 30 minutes or more of moderate-intensity PA (such as brisk walking) on most, if not all, days of the week [10]. Brisk walking should be of sufficient intensity so to induce training heart rate among cardiac patients [11], and improve cardiovascular fitness [12].

The evidence from previous studies indicated that after hospitalization, PA level of CAD patients declined [13] and physical functioning scores were

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significantly decreased [14]. The reasons behind the findings are likely to be due to a feeling of disability after CAD diagnosis and a low level of vigor that can impact patients' PA [15].

Previous studies on CAD among Thai patients after hospitalization have shown mixed results of fair [16, 17] and good levels [18]. Another study in Thailand showed that only 39.00% of CAD patients retained their exercise performance as they did before diagnosis of CAD and 51.20% did not do any exercise after diagnosis [19]. Another study showed that presence of comorbidity, physical symptoms and lack of time were some of the reasons for lack of exercise among these patients [20]. Obviously, after hospital discharge, patients with coronary heart disease had the lowest scores in physical and recreational activities [21].

Most of the new CAD patients also did not follow the minimal recommendation for health enhancing PA, even though their health status was excellent or very good. In addition, even though they were informed of the importance of PA related to cardiovascular condition, only 27.80% of them regularly performed their PA [22]. Moreover, in 2011, the American Heart Association and American College of Cardiology Foundation focused the importance of PA among CAD patients by stating that the clinician should encourage all patients with coronary and other atherosclerotic vascular disease to spend 30 to 60 minutes of moderate-intensity aerobic activity, such as brisk walking, at least 5 days and preferably 7 days per week [23].

Nowadays, the number of new CAD patients is on the rise and advancement in medicine has improved treatment outcomes, leading to an increasingly larger number of survivors with CAD. PA provides health benefits among CAD patients. PA is the body movement which everyone could easily perform alongside daily activities, i.e. work, transportation, domestic, and leisure time. In order to gain further knowledge on PA among new CAD patients after hospitalization, a study was conducted and focused on factors predicting PA among newly diagnosed CAD patients during the first three months after hospitalization.

## MATERIALS AND METHODS

A descriptive cross-sectional study was conducted among new CAD patients who were diagnosed with coronary angiography and attending the OPD medical clinic during the first three months after hospitalization. One hundred and sixty participants were recruited by a stratified random sampling technique, from 10 of 38 tertiary hospitals of all regions of Thailand. The sample size determination was based on a desired ratio of 20 respondents for 8 independent variables [24]. A sample size of 160 maintained the predetermination on statistical criteria of .05 and medium effect size (r = .30), which had the ability to detect an effect at the desired power around .90 [25]. Participants had no cognitive dysfunction or disorientation of time, person, and place, were able to read and write the Thai language, and were willing to participate in the current study. Exclusion criteria were 1) status posted coronary artery bypass surgery, and 2) in process with psychiatrist approach and follow up.

### Measures

Data was collected by self-reported questionnaires.

*1) Demographic questionnaire*

This questionnaire was developed by the researcher and used for personal data collection.

*2) International Physical Activity Questionnaire-Long form (IPAQ-L)*

The scale was modified from International PA Questionnaire Long form [26], and the Thai version used was the version of Leethong-In [27]. PA was divided into 4 domains (work, transportation, domestic, and leisure-time) and sitting time. The total score of the summation of all 4 domains calculated to MET-minutes/week. This measurement used median values and interquartile ranges (IQR) for comparison reports because of the Skewness of those physical activity measurements. The total scores were classified into three categories: low, moderate, and high levels. The sitting time was proposed by minutes per week. The internal consistency of this instrument was .63.

*3) Symptom Frequency and Symptom Distress Scale (SFSDS)*

This scale was modified from the Symptom Frequency and Symptom Distress Scale [28] and translated into Thai for the current study. The components of symptom frequency and symptom distress scale (SFSDS) are somatization, irritability-over sensitivity, cognitive-performance difficulty, depression, and fear-anxiety. The total score of physical symptoms was classified into three categories: low, moderate, and high levels. The internal consistency of this instrument was .96.

*4) Subjective Physical Activity Experiences Scale (SPAES)*

This scale was modified from the Subjective Exercise Experiences Scale [29] and translated into Thai for the current study. This scale was a measure of the global psychological responses to the stimulus properties of exercise, which consists of three factors, i.e. positive

**Table 1** Descriptive statistics of the physical activity intensity (MET-min/wk.), differentiated by 4 domains of physical activity (N = 160)

| Activity domain[*] | N=160 | Activity intensity (MET-min/wk.) | | |
|---|---|---|---|---|
| | (%) | Range | Median | IQR |
| Work | 67 (41.87) | 120-17232 | 1813.00 | 5202.00 |
| Transportation[**] | 153 (95.63) | 33-6426 | 594.00 | 792.00 |
| Domestic | 104 (65.00) | 30-14460 | 1135.00 | 2408.75 |
| Leisure-time | 118 (73.75) | 33-7038 | 693.00 | 1042.50 |
| **Total** | 160 (100.00) | 132-21102 | 2564.50 | 6048.00 |

[*] Multiple responses
[**] 2 sub-domains: by cycling, and by walking

well-being, psychological distress, and fatigue. The total score was classified into three categories: poor, fair, and good levels. The internal consistency of this instrument was .72.

*5) Family and Friend Support for Physical Activity Scale (FFSPAS)*

The scale was developed from the Social Support for Exercise Behavior (SSE) [30], and the Thai version used was the version of Leethong-In [27]. The scale measured the scores of support from family and from friends to perform PA. The total score was classified into three categories: low, moderate, and high levels. The internal consistency of this instrument was .93.

*6) Self-Efficacy for Physical Activity Scale (SEPAS)*

The scale was developed from the Self-efficacy-barriers-to-exercise [31], and the Thai version used was the version of Leethong-In [27]. The scale measured the patients' confidence level in their ability to perform PA. The total score was classified into three categories: low, moderate, and high levels. The internal consistency of this instrument was .97.

This study was approved by the ethics committee of all those 10 tertiary hospitals before data collection and all participants signed informed consent forms before participation in the study.

**Data analysis**

Descriptive statistics delineated characteristics of demographic variables. The regression was analyzed by LISREL with Robust Maximum likelihood estimation. The p-value < 0.05 was considered to show statistical significance.

**RESULTS**

Among the 160 new CAD patients, 63.75% were male, 63.75% had an age ranging between 50 and 69 years, 83.13% had completed secondary school or lower, and 94.37% lived with their family. The majority of participants (94.37%) knew the number of their coronary vessels that were occluded, and 76.25% knew that they also had morbidity. Ninety-three of 160 participants (58.12%) were overweight or had obesity, 36.88% had normal BMI, and only 5.00% had low BMI. All participants were hospitalized and underwent their first coronary angiogram, and 86.87% received health information before hospital discharge, but only 18.13% of all had participated in a cardiac rehabilitation program.

The participants engaging in PA before and after hospitalization was 55.63%, and 56.25%, respectively. Before CAD was diagnosed, most of the participants (62.92%) had no health problems or limitations effecting their PA's, while 33.71% and 3.37% had mild and serious problems, respectively. After hospitalization, 47.78% of participants had no health problems or limitations effecting their PA's, while 47.78% and 4.44% had mild and serious problems, respectively.

On average, the participants spent 1,800 min/wk for PA, and sitting 1,260 min/wk., while the total PA intensity was 6,048 MET-min/wk. Seventy-three percent and 30.00% performed moderate and vigorous activity intensity with a median of 1,920 (IQR = 3,385), and 900 (IQR = 2,880) MET-min/wk., respectively. Considering the number of participants who had PA in each domain, it was revealed that the majority of them performed PA in transportation domain (95.63%), in leisure-time, domestic and work domains (73.75, 65.00, and 41.87%, respectively) (Table 1).

**Predicting factors to physical activity**

Age had a significant negative correlation to PA (r = -.21; P<.01). Self-efficacy had a significant positive correlation to PA (r = .33; p<.01). Gender had a significant positive correlation to PA (r = .18; p<.05). Education had a significant negative correlation to PA (r = -.18; p<.05). Symptom distress had a significant negative correlation to PA (r = -.16; p<.05). Comorbidity, subjective experiences of PA, and family and friend support for PA had correlation to PA, but not significant (r = .04, -.15, and -.08,

**Table 2** Correlations between independent variables and physical activity (N=160)

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Age | 1 | | | | | | | | |
| Gender | -.136 | 1 | | | | | | | |
| Education | .243** | -.166* | 1 | | | | | | |
| Comorbidity | .025 | -.190* | .023 | 1 | | | | | |
| Symptom distress | -.037 | -.216** | -.006 | .243** | 1 | | | | |
| Subjective experiences | -.042 | -.056 | .071 | -.164* | .341** | 1 | | | |
| Fam- friend support | -.061 | -.003 | .056 | -.196* | .043 | .266** | 1 | | |
| Self-efficacy | -.107 | .201* | -.052 | -.163* | -.167* | .131 | .094 | 1 | |
| Physical activity | -.213** | .183* | -.175* | .039 | -.162* | -.146 | -.075 | .331** | 1 |

* Correlation is significant at the 0.05 level (2-tailed);
** Correlation is significant at the 0.01 level (2-tailed)

**Table 3** Regression analysis of Physical Activity (1,000 MET) among new coronary artery disease (CAD) patients after hospitalization with Robust Maximum likelihood estimation

| Predictors | b | Se | t | β | p-value |
|---|---|---|---|---|---|
| Age | -.079* | .031 | -2.51 | -0.173 | 0.013 |
| Gender | .556 | .768 | 0.72 | 0.054 | 0.473 |
| Education | -.932 | 1.069 | -0.87 | -0.070 | 0.386 |
| Comorbidity | .218 | .392 | 0.56 | 0.048 | 0.576 |
| Symptom distress | -.008 | .013 | -0.61 | -0.042 | 0.543 |
| Subjective experiences | -.037 | .044 | -0.85 | -0.068 | 0.397 |
| Family and friend support | .006 | .006 | 0.23 | 0.021 | 0.818 |
| Self-efficacy | .055** | .055 | 3.48 | 0.256 | < 0.001 |
| Dependent Variable: Physical Activity (1,000 MET)   $R^2 = 0.135$, $\chi^2 = 0$, df=1, p=1.00 | | | | | |

* $p < 0.05$, ** $p < 0.01$

respectively) (Table 2). The overall regression equation is shown in Table 3. The findings showed that age, gender, education, comorbidity, symptom distress, subjective PA experiences, family and friend support, and self-efficacy could predict PA among new CAD patients with the $R^2$ being .135. The predicted equation is as follows:

Physical Activity' = -.079age* + 0.556gender - 0.932education + 0.218comorbidity -0.008symptom distress -0.037subjective PA experiences + 0.006family and friend support + 0.055self-efficacy**

## DISCUSSION

Our participants were new CAD patients were older adults in the an age group of 50 - 69 years. Most of them were male and lived with their families. They also knew the severity of their disease and received health information. Even though they had comorbidity and health problems, they still performed PA in moderate to vigorous activities at moderate to high levels of PA. Their PA mostly related to standing or walking in all activity domains. The activity intensity was highest in the work domain, followed by domestic, leisure-time and transportation. The results of our study revealed some factors determined the PA performance.

Age had a significant negative correlation to PA (r = -.21; P < .01), similar to the study in myocardial infarction patients [32]. There was a significant difference of mobilization and exercise capacity between cardiac patients who were younger and older. Cardiac patients who were older had reduced exercise capacities, more limitations in mobility and a higher rate of disability than younger cardiac patients [33].

Gender had a significant positive correlation to PA (r = .18; p < .05). In our study, we found that being male had a correlation to PA which was similar to other studies. Among heart disease patients after hospitalization, males were more active than females [13], had more intention and motivation to exercise planning [34], and had a higher baseline for activity levels and higher exercise capacity than females. Female patients tended to report lower levels of PA and higher levels of disruption in functional ability [33].

Self-efficacy had a significant positive correlation to PA (r = .33; p < .01). Self-efficacy reflects one's confidence in the ability to perform a behavior in a given situation [35]. A study on health behaviors in CAD patients found that cardiac self-efficacy significantly affected health behaviors and had the greatest effect on health

behaviors [36]. Among heart disease patients, self-efficacy was strongly related to exercise intentions and motivation to exercise planning [34].

Education level had a significant negative correlation to PA (r = - .18; p < .05). Patients who had completed secondary school and lower performed PA more than those who had completed higher education. Education as a factor has variable correlation to PA in different studies. In one study, education had a positive correlation with PA among CAD patients [13] but the other one stated that level of education was not associated with exercise among CAD patients in cardiac rehabilitation programs [37]. In addition, among female patients with CAD who had low educational attainment had a higher significant drop-out rate of cardiac rehabilitation programs than male patients [38].

Symptom distress had a significant negative correlation to PA (r = -.16; p < .05) similar to other study where physical symptom distress inhibited performance of PA [33]. Thai CAD patients (24.40%) were afraid their exercise might lead to chest pain [19], and they did not exercise because they were tired, had a headache or felt faint [16]. Symptom distress was a subjective symptom and defined as the barriers to perform PA and might lead to fear or lack of interest to engage in PA [33]. Heart disease patients did not exercise after hospitalization because of their physical symptoms [20], and some patients experienced chest pain [19], tiredness, headache or felt faint after exercise [16].

Comorbidity (r = .04) was a factor of physical inactivity [20]. It was defined as the concurrent presence of two or more medically diagnosed diseases in the same person [39]. A study review [37] indicated that intrapersonal factors (i.e. fewer comorbidities, less severe cardiac illness) related to increased exercise levels, similar to this study. Although our participants were overweight or obese (58.12%) and faced increased health problems after hospitalization, they still performed moderate to high levels of PA.

Subjective experiences of PA (r = -.15) had a negative relation with PA, but did not meet statistical significance. The correlation between subjective experiences was varied among the studies. Some CAD patients thought that vigorous exercise was unnecessary and they could not have done anything to prevent their disease [20]. The first episode of myocardial infarction patients after hospitalization saw feelings of disability and anxiety [15]. On the other hand, it was found that activity-related affect positively related to exercise behavior [18], and well-being of body and mind, comfort and health related to PA [32].

Family and friend support for PA had negative correlation to PA, but not at significant levels (R = -.08). This predicting factor had varied results of correlation, similar to subjective experiences. In myocardial infarction patients, the support from a physically active partner was an important factor for inducing and for continuing PA [32]. A study review [37] indicated that the confidence in cardiac rehabilitation staff to assist in performing exercise behaviors was not associated with exercise. Patients who received education or exercise consultation sessions reported higher exercise levels, and also patients who received more social support reported higher exercise levels. But, marital status and subjective norm (i.e. perceived social pressure to engage in exercise) were not related to exercise. Moreover, this review indicated that higher perceived behavioral control (i.e. perceived ease of participating in exercise) was related to increase in PA.

Finally, we found that only 55.63% and 56.25% of our participants engaged in PA before and after hospitalization. An update guideline 2011 stated that cardiac rehabilitation is the Class I of Recommendations for all eligible out-patients with CAD post percutaneous coronary intervention (Level of Evidence :A) [23]. This current study found that 86.87% of the participants perceived health information before hospital discharge but only 18.13% of those participants took part in cardiac rehabilitation programs. Focus more on older people, female, and low self-efficacy level are importance in order to enhance PA.

## CONCLUSION

Self-efficacy and age were found to be significant predictive factors of PA among new CAD patients. It was also found that gender, education, and symptom distress had a significant correlation to PA. This is a descriptive cross-sectional study and therefore further studies among new CAD patients are needed to explore perspective on the leisure-time PA, to determine daily PA with the accelerometer, and to compare measurements between self-reported questionnaires and objective assessment using quasi-experimental design. In addition, intervention appropriate to living activities (domestic) and walking are required in order to enhance PA among female patients with new CAD.

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