İzmir Kâtip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi 2024; 9(1): 105-113
DOI: 10.61399/ikcusbfd.1284133

İKÇÜSBFD

ARAŞTIRMA / RESEARCH

Examination of Early Results of Physical Activity Counseling after Coronary Artery Bypass Graft Surgery

Koroner Arter Bypass Greft Cerrahisi Sonrası Fiziksel Aktivite Danışmanlığının Erken Dönem Sonuçlarının İncelenmesi

Zehra CAN KARAHAN[1], Yasemin BURAN ÇIRAK[2], Hülya ARIKAN[3]

[1]*Çankırı Karatekin University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Çankırı, Türkiye.*
[2]*İstinye University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, İstanbul, Türkiye.*
[3]*Atılım University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara, Türkiye.*

Geliş tarihi/Received: 30.05.2023
Kabul tarihi/Accepted: 16.11.2023

Sorumlu Yazar/Corresponding Author:

Zehra CAN KARAHAN, Asst. Prof.
Çankırı Karatekin University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Çankırı, Türkiye.
E-mail: zehracnkrhn@gmail.com
ORCID: 0000-0002-6919-2720

Yasemin BURAN ÇIRAK, Prof.
ORCID: 0000-0002-8044-8539

Hülya ARIKAN, Prof.
ORCID: 0000-0002-0028-4256

This study was presented as an oral presentation at the "13th Turkish Thoracic and Cardiovascular Surgery Association Congress with International Participation" in Antalya on 30 October - 02 November 2014.

Abstract

Objective: Physical inactivity, an important risk factor for coronary artery disease, should be increased after coronary artery bypass graft (CABG) surgery. The aim of this study was to examine the effects of early physical acitivity (PA) counseling in CABG patients.

Material and Method: Thirty male patients included in the study were randomly divided into two groups. Fifteen patients received PA counseling and routine physiotherapy, while the others received only standard physiotherapy. PA, exercise capacity, daily living activities, sleep quality, depression, and anxiety were assessed before and two weeks after surgery. All patients received an activity monitor (MF-SenseWear Armband) upon discharge for PA and energy expenditure evaluation. Energy expenditure, average MET, PA duration, laying and sleeping time, and daily steps were monitored for seven days after discharge.

Results: The 6-minute walking distance decreased from 507.87±77.70 m to 470.46±69.83 m in the PA group (p=0.001) and from 499.80±82.93 m to 448.00±64.25 m in the control group (p=0.002), but the difference was not significant (p=0.610). PA counseling did not significantly affect total energy expenditure (8516.10±1489.75 vs. 8568.75±999.68 joules, p=0.910), active energy expenditure (307.43 joules (min 13.57- max 3300.57) vs. 303.68 joules (min 30.71-max 11.68), p=0.412), mean metabolic equivalent (1.30±0.16 vs 1.17±0.17, p=0.057), PA duration (16.57 minutes (min 0.71-max 180) vs 16.85 minutes (min 3.57-max 58.71), p=0.367), the number of steps (723.86 steps (min 198.57-max 5944.14) vs 796.28 (min73.86-max 4217.86), p=1.000).

Conclusion: Our PA counseling did not improve PA and clinical outcomes after CABG surgery more than conventional treatment. Longer follow-ups are needed to demonstrate efficacy.

Keywords: Activity monitor, energy expenditure, physical activity counseling, coronary artery bypass.

Öz

Amaç: Koroner arter hastalığı için önemli bir risk faktörü olan fiziksel inaktivite, koroner arter bypass greft (KABG) ameliyatı sonrasında artırılmalıdır. Bu çalışmanın amacı, KABG ameliyatı geçirmiş hastalarda erken dönemdeki fiziksel aktivite (FA) danışmanlığının etkilerini incelemekti.

Gereç ve Yöntem: Çalışmaya dahil edilen 30 erkek hasta rastgele iki gruba ayrıldı. 15 hasta FA danışmanlığı ve rutin fizyoterapi alırken, diğerleri sadece rutin fizyoterapi aldı. FA, egzersiz kapasitesi, günlük yaşam aktiviteleri, uyku kalitesi, depresyon ve anksiyete ameliyattan önce ve iki hafta sonra değerlendirildi. Tüm hastalara taburcu olduktan sonra FA ve enerji harcaması değerlendirmesi için bir aktivite monitörü (MF-SenseWear Armband) takıldı. Enerji harcaması, ortalama MET değeri, FA süresi, yatma ve uyuma süresi ve günlük adım sayısı taburcu olduktan sonraki 7 gün boyunca izlendi.

Bulgular: 6 dakikalık yürüme mesafesi FA grubunda 507,87±77,70 m'den 470,46±69,83 m'ye (p=0,001) ve kontrol grubunda 499,80±82,93 m'den 448,00±64,25 m'ye (p=0,002) düşdü, ancak aradaki fark anlamlı değildi (p=0,610). FA danışmanlığı, toplam enerji harcamasını (8516.10±1489.75 karşı 8568.75±999.68 joule, p=0.910), aktif enerji harcamasını (307.43 joule (min 13.57-maks 3300.57) karşı 303.68 joule (min 30.71-maks 11.68), p=0. 412), ortalama metabolik eşdeğer (1.30±0.16 karşı 1.17±0.17, p=0.057), FA süresi (16.57 dakikaya (min 0.71-maks 180) karşı 16.85 dakika (min 3.57-maks 58.71), p=0.367), adım sayısı (723.86 adıma (min 198.57-maks 5944.14) karşı 796.28 (min73.86-maks 4217.86), p=1.000).

Sonuç: FA danışmanlığımız, CABG ameliyatı sonrası FA'yı ve klinik sonuçları geleneksel tedaviden daha fazla iyileştirmedi. Etkinliğin gösterilmesi için daha uzun takiplere ihtiyaç vardır.

Anahtar Kelimeler: Aktivite monitörü, enerji harcaması, fiziksel aktivite danışmanlığı, koroner arter bypass.

1. Introduction

In many countries, coronary artery disease (CAD) is a leading cause of death and disability (1). In the research of such an important health issue, greater focus should be placed on primary and secondary prevention rather than expensive therapies (2). CABG surgery, which occupies a major place in the treatment protocols for CAD, is becoming more effective with each passing year as new technologies are developed. Secondary prevention following this surgery reinforces the surgical success (3).

Physical activity (PA) is a major risk factor for cardiovascular disease. The positive impacts of engaging in PA have been extensively documented in enhancing cardiovascular function, exercise endurance, and overall well-being. Furthermore, PA has been shown to decrease mortality rates by 20%–30% and reduce the reoccurrence of unfavorable cardiovascular incidents (4,5). PA after coronary artery bypass grafting (CABG) is strongly recommended by the guidelines, specifically with a class IA recommendation (6). However, it is commonly seen that patients who have undergone CABG surgery tend to exhibit low levels of physical activity in the postoperative period. Increasing PA after CABG surgery is crucial for decreasing postoperative problems and preventing re-occlusion of the artery. Patients who participate in a regular exercise program and are informed to control cardiovascular risk factors had a lower incidence of postoperative complications and hospital readmission, according to the studies (7-8).

The studies in the literature are mostly on physical activity counseling within the framework of phase 2 cardiac rehabilitation in patients discharged after CABG surgery (9). To the best of our knowledge, there was no study in the literature that examined the early impact of PA counseling after CABG surgery. Our study's aim is to assess the short-term impact of PA counseling following CABG surgery on patients' at-home energy expenditure. Examining the influence of counseling on energy consumption was intended to establish objective outcomes. Our hypothesis is that physical activity counseling in the hospital after CABG surgery will increase energy expenditure after discharge.

2. Material and Methods

2.1. Patients and design

This study was performed on 30 patients who had undergone CABG surgery in Gulhane Education and Research Hospital between years 2014-2015. The Medical Faculty Non-Interventional Clinical Research Ethics Committee of Hacettepe University approved the study on April 24th in 2013 and assigned it the registration number GO 13/136. Written consent was obtained from all participants. The inclusion criteria were age between 40 and 80 years, absence of heart surgery, and absence of orthopedic and neurological conditions. Patients with a cerebrovascular incident, cognitive impairment, entubation for more than 24 hours, and postoperative thrombosis were excluded from the trial (10). In order to determine the sample size, calculations were made with the G*Power Version 3.1 program. Since there is no study similar to our study in the literature, a pilot study was conducted with 5 cases that met the inclusion criteria. Change in functional capacity was used to determine sample size. It was found that 14 patients should be included in the study in order to determine the effectiveness of the treatment with 80% power and 0.05 type 1 error, assuming that the difference before and after treatment in the training group was 39.33 m and the standard deviation was 44.66 with medium effect size (effect size=0.40). This effect size was obtained from a pilot study of 5 participants. The study was a single-blind randomized trial. Randomization was achieved using the block randomization technique. The study's flowchart is depicted in Figure 1. One patient from the PA counseling group died during surgery. Two patients from the same group were excluded from the study because they stayed in the intensive care unit for more than 2 days. One patient developed pneumothorax on the 2nd postoperative day, and 1 patient developed lobar atelactia on the 3rd postoperative day. These patients were excluded from the study because physical activity counseling could not be continued due to these complications. Additionally, one patient in this group was excluded from the study because the data could not be accessed because she did not wear the activity monitor regularly after discharge. In the control group, 2 patients were excluded from the study because they stayed in the intensive care unit for more than 2 days, 1 patient developed pneumothorax on the 3rd postoperative day, and 3 patients were excluded from the study because they did not wear the activity monitor constantly.

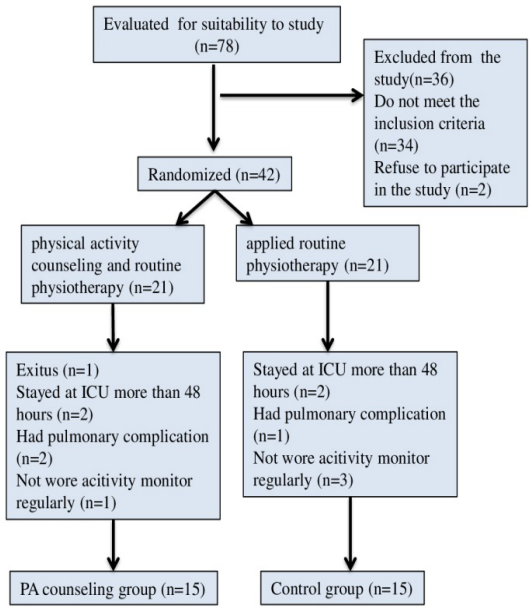

Figure 1. Flow Chart of the Study. (ICU: Intensive Care Unit)

2.2. Asessesment

Perioperative data (Total perfusion time, aortic clamping time) and demographic (age, heigh, body mass index) and clinical variables (risk factors, left ventricule ejection fraction, effected vessels, duration of mecanical ventilation, intensive care unit stay and hospitalization) were obtained. Preoperatively, on postoperative day 6 and one week following discharge, the 6MWT was administered to evaluate functional capacity. The 6-MWT was performed in accordance with the American Thoracic Society's standardized procedure.

Patients were instructed to walk as far as they could for six minutes in a 30-meter corridor. The distance they walked was recorded at the end of 6 minutes (11). All patients were given the IPAQ-short form to determine pre-operative PA levels. The IPAQ-short form has 9 items and measures exercise frequency and duration in three intensity levels: vigorous (VPA = 8.0 METs), moderate (MPA = 4.0 METs), and low (LPA=3.3 METs) across various domains, including leisure, gardening, work, and transportation on a weekly basis. Using data on physical activity frequency, duration, and estimated energy expenditure (MET•min/week), respondents were divided into three groups based on their physical activity levels: Based on the data pertaining to the frequency, duration, and estimated energy expenditure (MET•min/week) of physical activity, the participants were categorized into three distinct groups, each representing different levels of physical activity. A high physical activity level (HPAL) is defined as meeting any of the following criteria: to meet the recommended level of physical activity, individuals should engage in either three or more days of strenuous exercise, with a minimum energy expenditure (EE) of 1,500 METmin/week, or alternatively, participate in seven or more days of activities from a variety of intensity categories, each with a minimum EE of 3,000 MET•min/week. The moderate physical activity level (MPAL) is achieved by engaging in vigorous exercise for at least 20 minutes per day on 3 or more days, participating in moderate or low-intensity activity for at least 30 minutes per day on 5 or more days, or engaging in any combination of activities that result in an energy expenditure (EE) of at least 600 metabolic equivalent of task (MET) minutes per week on 5 or more days. Low physical activity level (LPAL) refers to a state of limited engagement in physical activities, when individuals either do not participate in any form of exercise or engage in some exercise but fail to achieve the recommended requirements set for moderate physical activity level (MPAL) (12).

Before the procedure and one week after the discharge, Pittsburg Sleep Quality Index (PSQI) was utilized to evaluate the sleep issues of study participants. PSQI is a self-report questionaire evaluates sleep quality over a period of one month. The measurement comprises of 19 discrete items, which combine to form 7 components and a single overall score. Each component is given a score ranging from 0-3, resulting in a total score ranging from 0-20 points. A score of 5 and above indicates poor sleep quality (13).

We employed the Hospital Anxiety and Depression Scale (HAD) to assess patients' anxiety and depression levels before and after surgery. The HADS is a 14-item scale with 7 items measuring anxiety and 7 items measuring depression. In the scale, the cut-off score for anxiety was 10/11, while it was 7/8 for depression (14). We evaluated the patients' activities of daily living using the Health Assessment Scale (HAQ). The questionnaire is an 8-section scale consisting of a total of 20 items. Each item is scored between 0-3. The scale consists of dressing, standing, eating, walking, hygiene, reaching, grasping and daily tasks sections. The highest score within the section is determined as the section score. All section scores are determined and a total questionnaire score with a value between 0-3 is obtained (15).

All individuals wore the MF-SenseWear Armband (BodyMedia, Inc., Pittsburgh, PA, USA) 24 hours a day for seven days following discharge. The SenseWear Armband is a multisensor body monitor that analyzes a variety of physiological and motion data using a 3-axis accelerometer, skin temperature sensor, galvanic skin response sensor, and heat flow sensors. The triaxial accelerometer monitors steps and movement. The skin temperature sensor detects the body's outermost layer temperature. The galvanic skin response sensor monitors the impedance of the skin, which reflects the skin's water content and the vascular peritoneal dilation and dilation. The heat flow sensor indicates the rate of heat emission from the body. Using algorithms established by the makers (SenseWear Professional SoftWare, version 6.1), the data received from these sensors, along with gender, age, body weight, energy expenditure, PA intensity, and number of steps, are calculated (16-19). The data from the Sensewear Armband was uploaded to the computer seven days later. The following variables were recorded: total energy expenditure (joules), PA duration (minutes), laying time (minutes), active energy expenditure (joules), number of steps, sleep length (minutes), and mean MET value.

2.3. Treatment Procedure

Patients received an education program on surgery and physiotherapy during the preoperative period. In addition, every patient received standard physiotherapy. This protocol was implemented from the day of extubation to the day of hospital discharge.

2.3.1. Physical Activity Counseling

PA counseling began on the first postoperative day and continued till discharge. Patients' PA levels were tested using the IPAQ-short form. In this study, motivational interviewing linked to the Transtheoretic change model was used (20). To determine the motivational level of patients, the question "How essential is physical activity to you?" was asked. Patients rated the response as "10" extremely essential and "0" not important. Similarly, the question "how much confidence do you have in yourself that you can do this if you want to be physically more active?" was used to measure the patients' ability to engage in PA. It was graded as "10 points" for "I am certain I can succeed" and "0 points" for "I am certain I will fail." Patients were tiered according to the data acquired from these questions in order to establish appropriate behavioral methods during PA counseling (21,22).

1. Patients with high motivation but low self-confidence: Strategies have been developed for these patients to boost self-confidence and eliminate the disabilities that produce low self-confidence. For instance, in patients who believe they lack sufficient energy (the most frequently cited cause), it was suggested that they engage in PA during times when they felt more energetic, and that their energy would increase as they engaged in PA.

2. Patients with high self-confidence but poor motivation: These patients were informed that the benefits of PA were the most effective means of preventing CAD, and they were supplied with an effective health education.

3. Patients with low motivation and low self-confidence: The effectiveness of behavioral treatments was found to be dose-responsive for patients with poor motivation and low self-confidence. It has been demonstrated that the combination of numerous methods and close follow-up is more successful for such patients. In response, the frequency of health education and motivational interviews with this group of patients has increased. In this group of patients, the number of phone calls made after being discharged increased beyond one. In addition, a daily or weekly plan for the PA was developed for this group and shared with the patient's family.

4. Patient group with both high motivation and self-confidence: This patient group focused on measures to ensure PA continuity and suitable exercise prescription (20-22).

During counseling, patient-specific solutions to physical activity (PA) barriers were devised. In addition, we utilized motivational interviews that incorporate patient-specific techniques to advance the patient to a higher stage.

Both groups received discharge education on the day of their release, which included information about what they should pay attention to and the guidelines they should follow. Patients were informed of a home exercise program and self-monitoring as well. A booklet on PA was provided to the intervention group. After discharge, the PA group received follow-up phone calls. They were questioned about their level of activity. They were reminded to perform the activities as suggested. Barriers to PA were identified, and suitable solutions were discovered.

2.4. Statistical Analysis

For statistical analysis, a Windows-based version of SPSS 16.0 (SPSS Inc., Chicago, USA) was utilized. For the demographic data, descriptive statistics were computed. Within the variables determined by counting, the mean standard deviation for the variables determined by measurement, frequency (percent), and frequency values were calculated. To determine if the variables were normally distributed, the Kolmogorov-Smirnow test was applied. When parametric test assumptions were provided for the comparison of two groups, the t test was employed for independent groups and the Mann Whitney U test was used if these assumptions were not met. Count-based variables were compared using the Chi-square test. Repeated analysis of variance was used to evaluate intra-group and inter-group changes. Utilizing the Bonferroni test, binary comparisons were done. The probability of error in each evaluation was determined to be $p<0.05$.

2.5. Ethical Aspects of the Research

The Hacettepe University Medical Faculty Non-Interventional Clinical Research Ethics Committee approved the study on April 24, 2013 and assigned it the registration number GO 13/136. Written consent was obtained from all participants. The research was conducted in accordance with the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards. The authors declare they have no conflict of interest. The authors have no funding to disclose.

3. Results

Perioperative information, demographic and clinical characteristics of the individuals are shown in Table 1. As seen in Table 2, when the two groups were compared, only the length of hospital stay was statistically higher in the FA group ($p= 0.046$). Table 2 provides a comparison of IPAQ scores between groups and PA levels of patients. There was no statistically significant difference between groups in terms of vigorous physical activity ($p=0.962$), moderate physical activity ($p=0.285$), walking time ($p=0.950$), or sitting time ($p=0.315$). The majority of patients had a low level of activity. In both groups, just two individuals had a high activity level. Table 3 displays a comparison of preoperative and postoperative HAQ, HADS, PSQI scores. The decline in HAQ scores over time was statistically significant in both groups ($p<0.001$ in FA group, $p<0.01$ in control group), but both groups demonstrated comparable restrictions in activities of daily living. Both groups' preoperative anxiety levels were below the cutoff, and there was no statistically significant difference between groups ($p=0.659$). Postoperative anxiety levels decreased significantly after surgery in both groups ($p<0.01$ for both). The preoperative depression levels of both groups exhibited a decrease below the established threshold, and no statistically significant difference was seen between the groups ($p=0.395$). All patients' depression levels also decreased in the postoperative term ($p<0.01$ for both). In addition, there is no statistically significant difference in sleep quality across the groups throughout the preoperative period ($p=0.396$). After surgery, sleep quality declines similarly in both groups ($p=0.245$).

Table 1. Demographic, Clinical Characteristics and Perioperative Data of Patients in the Physical Activity Counseling and Control Group

Characteristis	PA counseling group (n= 15)	Control group (n= 15)	p value
Body Mass Index(kg/m²), mean (SD)	26.77 (3.07)	27.50 (4.07)	0.556
Age (year), mean (SD)	53.66 (9.89)	56.86 (7.33)	0.323
Risk factors			
History of cigarette smoking, n (%)	5 (33.3)	8 (53.3)	
Family History, n (%)	11 (73.3)	10 (66.7)	
Hypertension, n (%)	6 (40)	8 (53.3)	
Diabetes Mellitus, on medication, n (%)	6 (40)	7 (46.7)	
Hypercholesterolemia, n (%)	3 (20)	7 (46.7)	
History of alcohol use, n (%)	1 (6.7)	1 (6.7)	
Ejection fraction, Median (Min-Max)	56.87 (38-65)	59.13 (50-69)	0.542
Total Perfusion Time in minutes, Median (Min-Max)	117.13 (77-161)	112.60 (60-317)	0.152
Aortic Clamping Time in minutes, mean (SD)	76.26 (19.75)	62.33 (20.86)	0.710
Duration of mechanical ventilation in hours, mean (SD)	10.20 (1.70)	10.96 (2.88)	0.383
Effected vessels, Median (Min-Max)	3.53 (2-5)	3.60 (1-5)	0.642
ICU stay (day), Median (Min-Max)	1.07 (1-2)	1.13 (1-2)	0.962
Duration of hospitalization (day), mean (SD)	7.93 (1.38)	7.00 (0.75)	**0.046***

ICU: Intensive Care Unit, SD: standart deviation, *p<0.05 Mann Whitney U Test, Student's-t Test)

Table 2. Results of Short Form of International Physical Activity Questionaire (IPAQ).

	PA counseling group (n= 15)	**Control group (n= 15)**	
IPAQ scores	**Median (Min-Max)**	**Median (Min-Max)**	***p***
Vigorous PA (MET- minutes per week)	224 (0-3360)	192 (0-2880)	0.962
Moderate PA (MET-minutes/week)	346.67 (0-1680)	32.00 (0-360)	0.285
Walking (MET-minutes/week)	837.30 (0-5544)	1231.93 (0-6930)	0.950
Sitting (minutes)	368 (180-600)	334.67 (120-600)	0.315
Total physical activity (MET-minutes/week)	1295.77 (0-6426)	1449.27 (0-6930)	0.786
Physical activity levels	**n (%)**	**n (%)**	***p***
Low PA level (≤600MET-min/week)	10 (66.7)	8 (53.3)	0.943
Moderate PA level (600-3000MET-min/week)	3 (20.0)	5 (33.3)	
High PA level (>3000MET-min/week)	2 (13.3)	2 (13.3)	

IPAQ: International Physical Activity Questionaire, PA: Physical Activity, MET: metabolic equivalent, Mann Whitney U Test

Table 3. Effects of Physical Activity Counseling On Daily Living Activities, Sleep Quality, Depression and Anxiety Level

		PA counseling group (n= 15)	**Control group (n= 15)**	
		X±SD	**X±SD**	**Group Difference p**
Health Assessment Questionnaire (HAQ) scores	Preoperative HAQ scores	0.70 ± 0.20	0.02 ± 0.95	0.442
	Postoperative HAQ scores	1.03 ± 0.420	0.94 ± 0.623	0.639
Intra-group difference (treatment effect) p		<0.001*	<0.01*	
Hospital Anxiety and Depression Scale (HADS)	Preoperative depression	5 ± 2.50	4.2 ± 2.57	0.395
	Postoperative depression	3.13 ± 159	3.53 ± 2.85	0.983
Intra-group difference (treatment effect) p		0.004*	0.279	
Hospital Anxiety and Depression Scale (HADS)	Preoperative anxiety	5.6 ± 2.09	6.13 ± 3.60	0.659
	Postoperative anxiety	2.26 ± 1.22	3.60 ± 2.64	0.196
Intra-group difference (treatment effect) p		<0.01*	<0.01*	
Pittsburg Sleep Quality Index(PSQI)	Preoperative PSQI scores	5.13±2.16	4.33 ± 2.87	0.396
	Postoperative PSQI scores	8.33 ± 2.74	9.60 ± 3.09	0.245
Intra-group difference (treatment effect) p		<0.01*	<0.01*	

PA: Physical Activity, HAQ: Health Assessment Questionnaire, HADS: Hospital Anxiety and Depression Scale, PSQI: Pittsburg Sleep Quality Index, Analysis of Variance in Repeated Measurements; * p <0.05

Table 4 shows the preoperative, postoperative and post-discharge 6-minute walk test distances. Postoperatively, the 6MWT distances reduced in both groups. There was no statistically significant difference between the groups in terms of the distances walked during 6MWT in the pre-operative (p=0.785), post-operative (p=0.865), and discharge periods (p=0.360). In the postoperative period, however, walking lengths decreased by 7.3% in the PA consulting group compared to 10.3% in the control group.

Table 5 displays the data acquired from the SenseWear Armband. There is no statistically significant difference between groups in terms of total energy expenditure (p=0.910), active energy expenditure (p=0.412), average MET value (p=0.057), PA duration (p=0.367), laying (p=0.545) and sleeping time (p=0.860), and number of daily steps (p=1.000) in the week following discharge.

Table 4. Effects of Physical Activity Counseling On Functional Capacity

Walking Distance of 6 Minute Walk Test (6MWT)	**PA counseling group (n= 15)**	**Control group (n= 15)**	
	X±SD	**X±SD**	**Group Difference p**
Preoperative 6MWT distance	507.87±77.70	499.80±82.93	0.785
Postoperative 6MWT distance	431.46±50.62	436.33±97.80	0.865
Discharge 6MWT distance	470.46±69.83	448.00±64.25	0.360
Intra-group difference (treatment effect) p	0.001*	0.002*	
Group * time p		0.610	

PA : Physical activity, 6MWT: 6 Minute Walk Test, Analysis of Variance in Repeated Measurements; * p <0.05

Table 5. Effects Of Physical Activity Counseling On Total Energy Expenditure, Active Energy Average MET Value, Physical Activity Duration, Lying And Sleeping Time And Number Of Daily Steps

	PA counseling group (n= 15)	**Control group (n= 15)**	
	X ± SD	**X ± SD**	**p**
Total energy expenditure (Joule)	8516.10±1489.75	8568.75±999.68	0.910
Lying duration (minutes)	183.52±69.35	202.70±99.53	0.545
Sleep duration (minutes)	132.93±59.66	137.34±75.16	0.860
Avarege MET value	1.30±0.16	1.17±0.17	0.057
	Median (Min-Max)	**Median (Min-Max)**	**p**
Physical activity duration (minutes)	16.57 (0.71-180)	16.85 (3.57-58.71)	0.367
Active energy expenditure (Joules)	307.43 (13.57-3300.57)	303.68 (30.71-1168.14)	0.412
Number of daily steps	723.86 (198.57-5944.14)	796.28 (73.86-4217.86)	1.000

MET: metabolic equivalent, Mann Whitney U Test, Students t Test)

4. Discussion

The most relevant finding of our study was that physical activity counseling during the acute phase had no effect on total energy expenditure, active energy expenditure, or physical activity duration after discharge. It is believed that controlling CAD risk factors will minimize nonfatal coronary events and cardiovascular death (23). We believed that risk modification should begin immediately following surgery. In our study, we aimed to examine the effect of PA counseling during hospitalization following CABG surgery on energy expenditure after discharge. When the physical activities during the preoperative period were analyzed using the IPAQ, it was determined that the majority of subjects had a low activity level (600 MET-dk/week) (training group 66.7%, control group 53.3%). In both groups, only two individuals had a high activity level (3000 MET-min per week). The homogeneity of the groups was a result of the similarity in preoperative PA levels between the two groups.

The anxiety and depression levels of the patients are important in patient education. In a study performed by Krannich and colleagues (21), HADS was performed 2 days before and 10 days after CABG surgery. While 25.8% of the patients had depression preoperatively, this rate decreased to 17.5% postoperatively. The anxiety finding, which was 34% before the operation, was determined to be 24.7% after the operation. In our study, similar to this study, depression and anxiety scores decreased. This decline was statistically significant for the training group but not for the control group. Regular PA is helpful in management of a variety of issues, including stress, anxiety, and depression.

Sleep disruptions and poor sleep quality are significant issues for heart surgery patients. Yilmaz and Iskesen (19) assessed the 45 CABG surgery patients. In the first week and month following surgery, PSQI ratings increased considerably, whereas total sleep length and sleep efficiency declined. In the second month after surgery, sleep metrics returned to preoperative levels (22). Similarly to the literature, sleep quality of our patients decreased following surgery. Poor sleep quality may have impaired patient's daily perception and focus. In addition, poor sleep quality might result in feelings of lethargy and drowsiness. This results in patients moving less. Consequently, the levels of total energy expenditure, active energy expenditure, and PA duration between the education and control groups may be one of the reasons why no difference was found.

6 MWT is not frequently administered to patients awaiting CABG surgery. Verrile and colleagues (23) discovered that 6 MWT distance decreased one week following CABG surgery. In our study, the 6 MWT distance fell by 7.3% in the PA group and 10.2% in the control group. The PA education had no effect on energy expenditure and PA duration, but it reduced functional capability decline. The pain of the incisions could be the cause of the reduction in functional ability due to the worry of a new cardiac episode. It indicates that the functional capacity of the group receiving PA therapy improves much more. We can claim that patients who are encouraged by a physiotherapist swiftly overcome their concerns and anxieties, hence increasing their mobility and functional capacities more rapidly than those who are not.

CABG surgery is an extremely dramatic procedure. Patients describe the surgical procedure as "passing from near-death". Fears are frequently expressed as having a second heart attack or failing to fully recover. The patient may have moved less due to this dread. Koivula and colleagues (24) investigated the fear and anxiety levels of individuals who underwent CABG surgery at various time intervals. Fear of death diminished after surgery, but after 3 months, 55% of patients still felt this way, and 7% of them felt it strongly. In the same study, it was found that 67% of patients feared having a second heart attack, and 14% rated their worry as high (24).

Individual in-person interviews began one day following CABG surgery and continued until patient discharge. Although healthcare professionals must enter and exit the room, extraneous stimulation may make it difficult for patients to concentrate. This could be one of the variables affected the efficiency of PA education. During future research, we believe it is preferable to conduct these trainings in a specific, isolated environment.

The discharge education was provided on the final day of hospitalization. Patients get confused when they receive so much information on the same discharge day (medication, controls, hygiene, nutrition, etc.). Patients may place a higher value on information on medications, controls, and nutrition than on PA. The PA training brochure was distributed on the day of discharge. Additionally, nurses and dietitians distribute their booklets. This may diminish the significance and effectiveness of our brochure.

Pain is one of the most important problems that patients feel even 2 weeks after surgery (28). The discomfort may have limited their mobility. Consequently, both groups had comparable total energy expenditures, average MET values, active energy expenditures, and PA durations.

There are no studies on PA counseling after CABG surgery in phase 1 cardiac rehabilitation in the literature. Izawa et al. (29) studied the effectiveness of accelerometry in PA training for cardiac patients in phase 1 cardiac rehabilitation (CR). The average daily number of steps and daily energy expenditure were comparable across the control and intervention groups at the outset. However, the number of daily steps and energy expenditure were significantly greater in the training group prior to phase 2 CR. (8,609.6 to 5,512) and 242.6 kcal, respectively (155.9 kcal). In our study, the SenseWearArmband activity monitor was utilized, although it does not display any information to the patient. Only the information stored in the computer is visible. Consequently, the introduction of accelerometers after the hospitalization period could enhance the efficacy of our investigation.

In a study of individuals with acute coronary syndrome, the influence of pre-discharge education on a healthy lifestyle was evaluated (30). The training lasted around one hour and took place in the patient's room. Three aspects of lifestyle were considerably more prevalent in the training group: health-related obligations, the interaction between nutrition and people, and health-related responsibilities. However, similar to our research, they found no difference between the intervention group and the control group.

This is due to the fact that Jordanians do not view physical activity as one of the most important learning priorities and an essential component of daily life (29). There was no study in the literature examining the learning priorities of cardiac patients in Turkish society. Further studies should evaluate learning priority.

After CABG surgery, PA counseling in the hospital during the acute phase had no effect on energy expenditure one week after discharge. There are no studies in the literature that examine the impact of PA counseling on the energy expenditure of CABG patients. The strength of our study is that it gives us the idea of objectively assessing factors such as energy expenditure, physical activity duration, sleep duration and step count in these patients. . Previously, we had no idea how much energy patients expended at home after such a major surgery. Not being able to follow up the participants for a long time after discharge is also a limitation of our study.

5. Conclusions and Recommendations

PA counseling at the hospital stage for CABG surgery patients had little effect on their energy expenditure during the first week at home.Continuing physical activity counseling after the negative effects of the surgery have subsided will help increase the PA level. Therefore, longer follow-up investigations are required.

If training is administered during an acute period, the prioritization of learning prior to surgery may be evaluated, and training can be administered in a more isolated, calm environment in accordance with these goals. To benefit from the feedback aspect of activity monitors, devices that allow patients to view values can be employed. To increase the effectiveness of a phone call, additional calls might be made.

6. Contribution to the Field

Inactivity is a major risk factor for numerous diseases, including coronary artery disease. After CABG surgery, it is crucial to improve physical activity. In our study based on this theory, we discovered that physical activity counseling was ineffective during the acute phase. For PA counseling, it is preferable to arrange after the patient has overcome the difficulties immediately following surgery. There are no published research assessing the effects of physical activity counseling on the energy consumption of CABG surgery patients. Our study has given us the idea to assess factors such as energy expenditure, duration of physical activity, sleep duration, and number of steps in an objective manner.

Ethical Aspects of the Research

The Hacettepe University Medical Faculty Non-Interventional Clinical Research Ethics Committee approved the study on April 24, 2013 and assigned it the registration number GO 13/136. Written consent was obtained from all participants. The research was conducted in accordance with the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards. The authors declare they have no conflict of interest. The authors have no funding to disclose.

Conflict of Interest

This article did not receive any financial fund. There is no conflict of interest regarding any person and/or institution.

Authorship Contribution

Concept: ZCK, YBÇ, HA; **Design:** ZCK, YBÇ, HA; **Supervision:** ZCK, YBÇ, HA; **Funding:** ZCK; **Materials:** ZCK; **Data Collection/Processing:** ZCK; **Analysis/Interpretation:** ZCK; **Literature Review:** ZCK; **Manuscript Writing:** ZCK; **Critical Review:** ZCK, YBÇ, HA.

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