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ORIGINAL RESEARCH

# Walking Exercise and Its Effect on Functional Capacity and Productivity in Post-Coronary Artery Bypass Graft (CABG) Patients: A Randomized Controlled Trial

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**Abstract**

**Background:** Post-CABG patients may experience several problems following surgery. Their functional capacity and productivity often decline after the procedure. Walking exercise is considered beneficial for improving functional capacity and productivity, as it can increase cardiac output. However, previous studies have shown mixed results, highlighting the need for further research that takes into account variables such as the type, intensity, frequency, and duration of exercise to better understand its impact.
**Purpose:** This study aimed to assess the effect of walking exercise on functional capacity and productivity in patients after CABG.
**Methods:** This study used a Randomized Controlled Trial (RCT) design with a single-blind outcome assessor. The sample size was 42 respondents, who were divided into the intervention and control groups. The intervention group received walking exercise and leg straightening, while the control group received only leg straightening. The 6-Minute Walking Test (MWT) was used to measure functional capacity, while the WPAI measured productivity. Data analysis used independent and dependent t-tests for normally distributed variables such as functional capacity, impairment while working, and activity impairment, and Mann-Whitney and Wilcoxon tests for variables that were not normally distributed, such as work time missed and overall work impairment.
**Results:** This study showed a significant effect of walking exercise on functional capacity (6.262±0.597 vs. 5.762±0.559, $p$=0.008), impairment while working (27.14±10.556 vs. 36.67±12.383, $p$=0.011), and activity impairment (23.81±6.690 vs. 19.52±6.690, $p$=0.044). Moreover, the study's results showed no significant difference in work time missed (4.086±7.003 vs. 3.900±6.288, $p$=0.967) and overall work impairment (3.795±4.756 vs. 3.757±4.628, $p$=0.696) between the groups.
**Conclusion:** Walking exercise improves cardiac function and metabolism, which increases adenosine triphosphate (ATP) production, thereby enhancing functional capacity and productivity in patients. Nurses should play active roles in encouraging and educating post-CABG patients to incorporate regular walking exercises into their recovery routines.

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## 1. Introduction

Coronary Artery Bypass Graft (CABG) is an interventional procedure performed to restore coronary perfusion by creating a bypass in an occluded coronary artery (Pamungkas et al., 2023). Globally, CABG procedures are performed at an average of 44 per 100,000 individuals (Chen et al., 2018). In Indonesia, the annual report from the National Cardiovascular Centre Harapan Kita recorded an increase in CABG procedures from 458 cases in 2020 to 634 cases in 2021 (National Heart Centre Harapan Kita, 2022). The high incidence highlights the importance of addressing the various conditions faced by patients. CABG presents experiences and challenges that make the recovery period complex (Ahmad et al., 2021). The expected outcomes after CABG include improved perfusion and oxygen delivery to the heart, increased functional capacity, an active lifestyle, and the ability to resume pre-illness physical activity and a return to work. However, patients often remain concerned about the impact of surgery on their daily activities, work, and social interactions. These concerns stem from uncertainty about the surgical outcomes, possible side effects, and the recovery process (Ebrahimi et al., 2025), making them critical issues that need to be addressed immediately.

The problem of decreased functional capacity in post-CABG patients has been identified in previous studies. Research conducted by Cordeiro et al. (2022) stated that the average value of the 6-Minute Walking Test (6MWT) before CABG was 386 meters, but after CABG, it decreased to 285 meters. This indicates a decline in functional capacity in patients before and after surgery. The decrease can be caused by reduced protein synthesis, increased proteolysis, and loss of muscle mass and strength (Sumin et al., 2022). A decrease in functional capacity is relevant to a reduction in physical activity because functional capacity reflects a patient's ability to perform activities of daily living that require sustained aerobic metabolism (Fathin & Imania, 2021). The prevalence of physical activity among patients after undergoing CABG has also been identified. Jonsson et al. (2014) stated that post-CABG patients who performed regular activity and exercise only reached 30.4%. This shows that less than half of the patients were not able to perform regular activities and exercises. This is supported by Foster et al. (2021), who stated that patients with high activity levels did not reach 50% of the total number of respondents. The activity referred to in patients includes not only daily living but also their productivity in returning to work after illness.

The return-to-work process is another aspect that needs to be considered in post-CABG patients. The National Health Service [NHS] (2021) stated that patients can gradually return to work 6 to 8 weeks after CABG surgery. This contrasts with a study by Mortensen et al. (2022), which found that 33.5% of patients did not return to work, while others resumed work 30 weeks after surgery. Mehrdad et al. (2016) also reported that being absent from work for 12 weeks can reduce the likelihood of returning to work by 50%. This may be due to patients experiencing physical limitations or weaknesses in performing work-related tasks (Ahmad et al., 2021). Problems such as reduced physical activity and failure to return to work after CABG must be addressed to improve patient productivity. Physical exercise, a component of cardiac rehabilitation, can help maintain or restore patients' optimal condition. It also serves as a secondary preventive measure to enable patients to return to productive lives (Indonesian Heart Association, 2019). However, the importance of cardiac rehabilitation is not yet fully understood by patients. This is evidenced by low patient compliance, particularly in performing phase III of cardiac rehabilitation.

Cardiac rehabilitation phase III is a home-based program aimed at re-educating patients, creating at-home exercise routines, and maintaining healthy lifestyle habits independently. This differs from phases I and II, which are hospital-based. The prevalence of post-CABG patients who do not participate in phase III rehabilitation is higher than that of those who do. Ganga et al. (2016) stated that only 19% of patients enrolled in phase III rehabilitation. Phase III aims to maintain an active lifestyle, increase physical activity and flexibility, and strengthen aerobic capacity (Tameler, 2014; Tessler & Bordoni, 2021). Factors contributing to low compliance with phase III include patient distance from facilities, lengthy referral processes, lack of follow-up, and perceptions that cardiac rehabilitation is not important (Foster et al., 2021; Soroush et al., 2018). Meanwhile, independent physical exercise at home can help address decreased functional capacity and productivity without requiring transportation or proximity to healthcare services. The goal of physical exercise is to increase the patient's functional capacity. This improvement is expected to correlate with increased activity levels and, consequently, higher productivity of the patients (Thomas et al., 2019).

Walking exercise, a form of aerobic activity, was chosen in this study because it is accessible to most patients and is known to improve physical fitness. It does not require any special skills, facilities, or expensive equipment (Bowden et al., 2021), and it helps train the heart and lungs (Kusumo, 2020). Additionally, walking is believed to increase cardiac output (Aritonang et al., 2018). Previous research has reported that walking exercises positively affect physical activity levels and functional ability (Primasari et al., 2022). However, this contrasts with the findings of Mubarak (2018), who reported no statistically significant effect of walking exercise on functional capacity. This inconsistency indicates a research gap, suggesting a need for further investigation. Nurjannah et al (2022) also emphasized the importance of future research on walking exercises that consider key components, such as type, intensity, frequency, and duration. Therefore, the present study was conducted to assess the effect of walking exercises on the functional capacity and productivity of post-CABG patients.

## 2. Methods

### *2.1. Research design*

This study used a two-arm, parallel randomized controlled trial (RCT) design, with a 1:1 ratio. The research was guided by the CONSORT statement for RCTs. It was conducted through several stages: enrollment, allocation, follow-up, and analysis (Figure 1).

### *2.2. Setting and samples*

The research process took place from May to July 2023. The sample size was calculated using the hypothesis test formula for the mean of two independent populations (Chen et al., 2018; Sastroasmoro & Ismael, 2014). Participants were post-CABG patients in phase III of cardiac rehabilitation. The inclusion criteria were as follows: patients who had completed phase II of cardiac rehabilitation; residing in the Jakarta, Bogor, Depok, Tangerang, and Bekasi (JaBoDeTaBek) areas; aged 18-60 years; classified as having mild to moderate risk (Table 1); without mobility limitations; not routinely performing aerobic exercise based on set time intervals and types; and able to communicate effectively.

A total of 45 patients were approached to participate in the study. Two patients declined due to work commitments, and one withdrew before the intervention due to time constraints. Thus, 42 patients met the inclusion criteria and agreed to participate. On the recruitment day, the researcher assessed the eligibility of potential participants. Patient data were initially reviewed via medical records, including the color code (pink indicates CABG patients), age, and residence. Communication ability was observed during the evaluation. The patient's risk stratification was determined by a physician, and the researcher confirmed this from the medical record.

The study began with a randomization process using the website www.randomizer.org. Numbers from 1 to 42 were randomly divided into two sets. Set one was assigned to the intervention group, and set two to the control group. Allocation concealment was maintained using sealed, opaque envelopes, which were opened sequentially as participants were enrolled. This process ensured an equal distribution, with 21 participants in each group.

**Table 1**. Mild to moderate risk stratification

| Mild Stratification | Moderate Stratification |
|---|---|
| a. Absence of complex ventricular dysrhythmias during exercise testing and recovery;<br>b. Absence of angina or other significant symptoms (e.g., unusual shortness of breath, dizziness, or lightheadedness during exercise testing and recovery);<br>c. Presence of normal hemodynamics during exercise testing and recovery (i.e., increases and decreases in heart rate and systolic blood pressure corresponding to increases in workload and recovery);<br>d. Functional capacity ≥7 metabolic equivalents (METs);<br>e. Resting ejection fraction ≥50%;<br>f. Uncomplicated myocardial infarction or revascularization procedure;<br>g. Absence of complicated ventricular dysrhythmias at rest;<br>h. Absence of congestive heart failure;<br>i. Absence of signs or symptoms of post-event/post-procedure myocardial ischemia;<br>j. Absence of clinical depression. | a. Presence of angina or other significant symptoms (e.g., unusual shortness of breath, dizziness, or dizziness occurring only on high-level activity [≥7 METs]);<br>b. Mild to moderate degree of silent ischemia during exercise test or recovery (ST-segment depression <2 mm from baseline);<br>c. Functional capacity <5 METs;<br>d. Resting ejection fraction 40%-49%. |

Source: (American College of Sports Medicine, 2014)

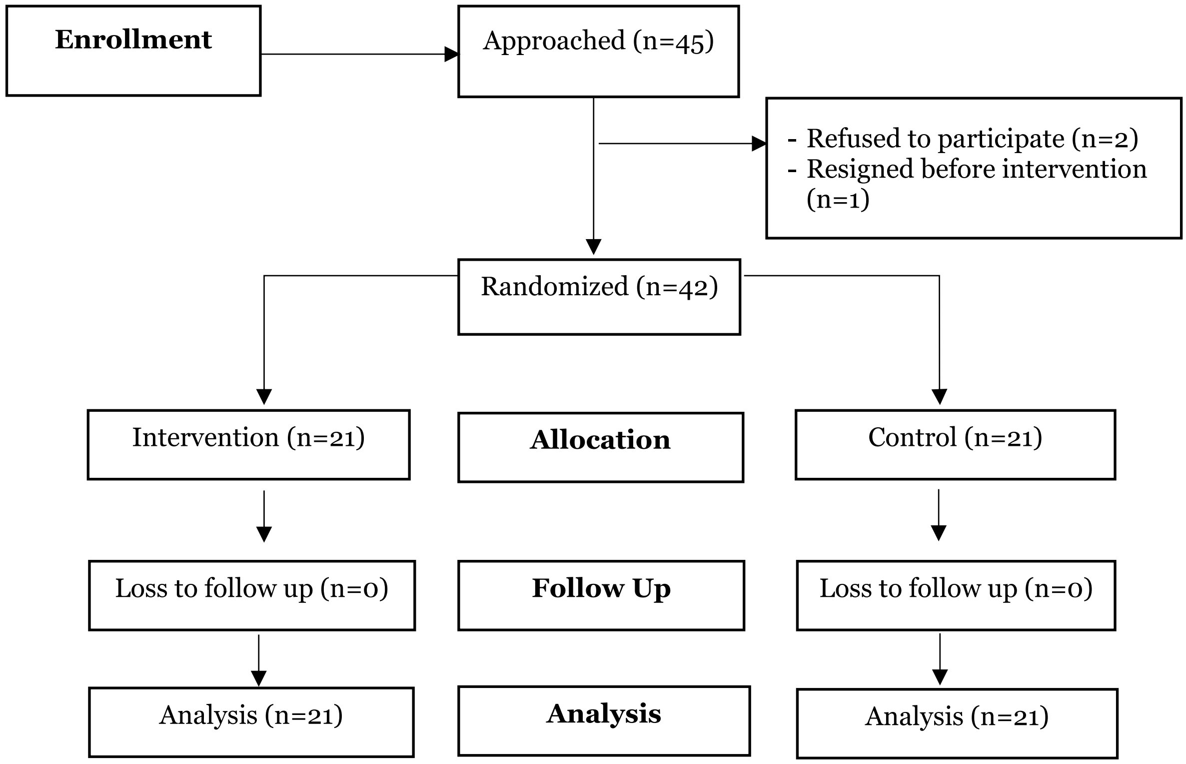


**Figure 1.** Randomized controlled trial structure

*2.3. Intervention*

The intervention group in this study received a walking and leg straightening exercise program. Patients and families were taught how to perform the intervention by the researcher, and they were given a module as a guideline in performing the exercises. Walking exercise was performed three times a week at an intensity of 60-80% of the maximal heart rate for 50 minutes, divided into three parts: warming up for 10 minutes, walking exercise for 30 minutes, and cooling-down for 10 minutes. In addition, participants in the intervention group also performed leg straightening exercises every day for 10 minutes. The patient's legs were raised alternately until fully straight. Meanwhile, the control group received only a leg straightening program, performed daily for 10 minutes. During the exercise process, participants were accompanied by their families, and the researcher monitored them through video conferencing. The researcher gave verbal instructions to ensure the exercises were performed correctly, and also asked the family members to refer to the exercise module. Additionally, each participant recorded their exercises on a monitoring sheet, including start and end times, pulse (before warming up, after warming up, after walking, and after cooling down), and any complaints during the exercise.

*2.4. Measurement and data collection*

This study used a single blind design for the outcome assessors. Six outcome assessors were involved, selected based on their qualifications as nurses with a minimum certification of Basic Trauma Cardiac Life Support (BTCLS). They were assigned by region (Bogor, Depok, Jakarta, Tangerang, and Bekasi) based on the study location. A shared understanding was established with the outcome assessors to avoid assessment errors. An interrater reliability test was conducted, resulting in kappa coefficients >0.6 (0.898, 0.801, 1.000, 0.898, 1.000, and 0.899), indicating no perceptual differences between the researcher and outcome assessors in assessing functional capacity and productivity. The outcome assessors were not involved in the research process, and participants were instructed not to disclose their treatment to the assessors.

In this study, functional capacity was measured using the 6-Minute Walking Test (6MWT) (American Thoracic Society, 2002). Participants were asked to walk for six minutes on a flat, obstacle-free track prepared the researcher. Participants who experienced fatigue during the walk were allowed to rest without stopping the timer. The distance, age, and weight of the patients were then entered into a formula to calculate Metabolic Equivalent of Tasks (METs), representing their functional capacity, as follows: METs = ((0.06 × walking distance) − (0.104 × age) + (0.052 × weight) + 2.9) ÷ 3.5 (Lavie et al., 2009).

Productivity was assessed using the Work Productivity and Activity Impairment (WPAI) questionnaire (Reilly et al., 1993). The researcher obtained consent to use the questionnaire, and it is available in Indonesian. The WPAI has a strong correlation with health outcomes (r = 0.67–0.77), and is valid for assessing work and activity impairment in patients (Zhang et al., 2010). It has been used in several studies to evaluate productivity changes in cardiovascular patients, including those with heart failure (Fonseca et al., 2021). The questionnaire includes six questions on current employment status, hours missed due to health problems, hours missed for other reasons, hours worked, the degree to which health affected productivity at work, and the degree to which health affected regular activities. Outcomes assessed included number of hours lost at work, impairment while working, overall work impairment, and activity impairment. The formulas used to assess the four indicators in this study are as follows: Hours lost at work = Q2/(Q2+Q4); Impairment while working = Q5/10; Overall work impairment = Q2/(Q2+Q4) + ((1−(Q2/(Q2+Q4))) × (Q5/10)); and Activity impairment = Q6/10 (Zhang et al., 2010).

*2.5. Data analysis*

The data were analyzed using SPSS version 25. Both univariate (participant characteristics, functional capacity, and productivity) and bivariate analyses (functional capacity, and productivity) were conducted. Productivity was divided into four domains: work time missed, impairment while working, overall work impairment, and activity impairment. Before bivariate analysis, homogeneity and normality tests were performed. The Shapiro Wilk test showed that data for functional capacity ($p$=0.513), impairment while working ($p$=0.125), and activity impairment ($p$=0.969) were normally distributed, allowing for analysis using dependent and independent t-tests. However, the variables of work time missed and overall work impairment were not normally distributed ($p$=0.001), so they were analyzed using the Wilcoxon and Mann-Whitney tests.

*2.6. Ethical considerations*

This research adhered to ethical principles by providing explanation regarding the process, purpose, benefits, and risks of participation and obtained informed consent from all participants. Confidentiality was maintained by keeping participant identities anonymous, and the principle of justice was upheld by treating all participants equally regardless of ethnicity, religion, race, and custom. Furthermore, the principle of beneficence was also followed, with the aim of encouraging participants to adopt an active lifestyle through participation. This research also received ethical clearance from the Institutional Review Board (IRB) of the National Cardiovascular Centre Harapan Kita, Indonesia, with the approval number: DP.04.03/KEP064/EC043/2023. This study was also registered at ClinicalTrials.gov with registration number NCT06013605.

## 3. Results

*3.1 Characteristics of the participants*

The results showed that most of the participants were male in both the intervention and control groups, with 18 respondents each (85.7%). Of the 21 participants in the intervention group, most had a secondary education level (66.7%), while in the control group, more than half had higher education (52.4%). The mean age of participants in the intervention group differed by 2.81 years from the control group, with the youngest being 42 years in the intervention group and the oldest being 60 years in both groups. The mean BMI in the intervention group decreased by 0.18 from pre-treatment to post-treatment, with the lowest value of 18.3 and the highest value of 33.5. In the control group, the mean BMI also decreased by 0.33, from pre-treatment to post-treatment, with the lowest value of 17.3 and the highest value of 36.2 (Table 2).

*3.2 Differences in mean functional capacity and productivity*

The mean functional capacity in the intervention group increased by 0.638 METs from pre-treatment to post-treatment, with the smallest value of 4.5 METs and the highest value of 7.4 METs. In the control group, functional capacity also increased by 0.100 METs, with the lowest value of 4.6 METs and the highest value of 6.8 METs. Statistical results showed a significant effect on the functional capacity of patients before and after treatment, with p-values of 0.001 and 0.003 in the intervention and control groups, respectively (Table 3).

**Table 2.** Frequency distribution of respondent characteristics (n=42)

| | Intervention Group (n=21) | Control Group (n=21) |
|---|---|---|
| Age | 54.24 ± 5.029 (M±SD) | 57.05 ± 3.201 (M±SD) |
| Gender | | |
| Female | 3(14.3%) | 3(14.3%) |
| Male | 18(85.7%) | 18(85.7%) |
| Education | | |
| Basic education | 1(4.8%) | 0 |
| Secondary education | 14(66.7%) | 10(47.6%) |
| Higher education | 6(28.6%) | 11(52.4%) |
| Body Mass Index (BMI) | | |
| Pre-treatment | 24.26 ± 4.527 (M±SD) | 25.29 ± 4.565 (M±SD) |
| Post-treatment | 24.08 ± 4.064 (M±SD) | 24.96 ± 3.784 (M±SD) |

Meanwhile, the mean percentage of work time missed by participants in the intervention group decreased by 1.376%, with the lowest value of 0.0% and the highest of 37.5%. In the control group, the mean percentage of work time missed increased by 0.095%, with the lowest value of 0.0% and the highest of 20.8%. For the impairment while working variable, participants in the intervention group experienced a 16.67% decrease in work interruption, with the lowest value of 10% and the highest of 80%. In the control group, impairment while working decreased by 3.81%, with the lowest value of 0% and the highest of 60%. The results showed no significant difference in work time missed; however, there was a significant difference in impairment while working in both the intervention and control groups (Table 3).

Regarding overall work impairment, participants in the intervention group experienced a decrease in the mean score of 0.019%, with the lowest value of 0.3% and the highest of 16.8%. Conversely, the control group showed an increase of 0.462%, with the lowest value of 10% and the highest of 70%. For activity impairment, the mean score in the intervention group decreased by 20.48%, with the lowest value of 10% and the highest of 70%. In the control group, the mean activity impairment also decreased by 20.96%, with the lowest value of 10% and the highest of 70%. The results showed no significant difference in the overall work impairment in both groups, while activity impairment demonstrated a significant difference in both the intervention and control groups (Table 3).

**Tabel 3.** Results of differences in mean functional capacity and productivity (n=42)

| Variable/ Domain | Intervention Group (n=21) | | | Control Group (n=21) | | | MD post-treatment (B) | *p* (B) |
|---|---|---|---|---|---|---|---|---|
| | Baseline (M±SD) | Post-treatment (M±SD) | *p* (W) | Baseline (M±SD) | Post-treatment (M±SD) | *p* (W) | | |
| Functional capacity | 5.624±0.652 | 6.262±0.597 | 0.001* | 5.662±0.551 | 5.762±0.559 | 0.003* | 0.500 | 0.008* |
| Work time missed | 5.462±8.459 | 4.086±7.003 | 0.300 | 3.805±5.053 | 3.900±6.288 | 0.859 | 0.186 | 0.967 |
| Impairment while working | 43.81±13.956 | 27.14±10.556 | 0.001* | 40.48±10.235 | 36.67±12.383 | 0.134 | 9.524 | 0.011* |
| Overall work impairment | 3.814±2.891 | 3.795±4.756 | 0.867 | 3.295±2.845 | 3.757±4.628 | 0.503 | 0.038 | 0.696 |
| Activity impairment | 44.29±14.343 | 23.81±6.690 | 0.001* | 40.48±14.655 | 19.52±6.690 | 0.001* | 4.286 | 0.044* |

*Notes.* *Significant at $p$<0.05; (W) shows the result in the within-group; (B) shows the result in the between-group

## 4. Discussion

This study was conducted to assess the effect of walking training on the functional capacity and productivity of post-CABG patients. The analysis results showed an increase in average functional capacity after participants completed four weeks of walking exercise. This aligns with research by Fiana et al., (2016), which also found increased functional capacity after four weeks of aerobic exercise. Functional capacity can be interpreted as an individual's ability to carry out activities of daily living (ADL) (Hinkle et al., 2018); thus the higher the functional capacity value, the more capable a person is of engaging in more strenuous activities (Ashok et al., 2017). In this study, participants in the intervention group experienced an increase of 0.638 METs. This improvement enabled participants to walk faster than two kilometers per hour (Aryasa, 2023) or an increase walking distance of nearly 152 meters (American College of Sports Medicine, 2014). Physiologically, walking exercise contributes to thickening of the ventricular wall, increased ventricular reserve, and improved heart muscle capability. It also increases the amount of blood pumped by the heart per contraction. During this exercise, the body attempts to maintain a balance between metabolic supply and demand, which increases oxygen needs in the muscles used. The cardiovascular system adjusts accordingly to ensure that actively working skeletal muscles receive adequate blood flow to meet their metabolic demands (Kusmanto, 2021).

The findings of this study align with research conducted by Mubarak (2018), which reported an increase in functional capacity after walking exercise among prospective pilgrims of healthy age. In Mubarak's study, functional capacity in the treatment group increased by 0.45 METs. Walking exercise is a safe, inexpensive, and simple form of exercise that can be performed at any time and easily adapted. This is supported by Bowden et al., (2021) who state that walking exercise is one of the easiest exercises to perform as it does not require equipment and can be done anywhere. The two studies share similarities in their implementation procedures, where walking exercises were carried out for 30 minutes in the range of 3-5x/minute with moderate intensity. The difference lies in the duration of training. Mubarak (2018) conducted walking training for eight weeks with a mean difference of 0.45 METs. In contrast, the present study implemented a 4-week walking exercise program with a frequency of three times per week to accommodate participants' work schedules, so that their working hours were not disturbed. Within this duration, the average change in functional capacity in the intervention group before and after the treatment was 0.638 METs. Participants in this study had already completed phase II of cardiac rehabilitation, allowing them to adapt and undergo previous exercise process.

This study showed no significant difference in the variable of lost work time. Respondents in this study on average had returned to work at the end of phase II of cardiac rehabilitation. This is supported by Fiana et al., (2016), who reported that patients may return to work after two weeks of cardiac rehabilitation. As a result, respondents likely aimed to maximize their time at work before starting phase III, compensating for days missed during previous treatment. This finding is consistent with Gharasi-Manshadi et al. (2018), who found that 58.9% of participants did not experience absenteeism and attended work regularly.

The results of this study also showed a decrease in impairment while working among participants after treatment compared to before treatment. Walking exercises performed by the participants may help reduce fatigue, maintain and improve physical function, and contribute to a better quality of life, enabling them to perform better at work (Tabata et al., 2022). Improved performance at work may also result from increased functional capacity, which serves as one of the criteria for evaluating return-to-work readiness. A higher functional capacity indicates that individuals are capable of performing more strenuous activities. A functional capacity evaluation is a comprehensive and objective evaluation of a worker's abilities, identifying both current capacities and potential barriers, and highlighting any short-term or long-term risks associated with continuing regular work. Functional capacity evaluations use measurable tests that can be interpreted and compared with job demands (Canadian Centre for Occupational Health and Safety [CCOHS], 2022).

Overall work impairment in this study showed no significant difference after the walking exercise. Pender et al. (2015), through the Health Promoting Model (HPM), view that individuals with health problems may not work as effectively as desired by the employers. Therefore, workplace exercise programs like walking exercises should be conducted as it has the potential to promote healthy behaviors, increase productivity, reduce absenteeism, lower healthcare costs, and decrease disability claims.

The findings of this study also showed that activity impairment was reduced after walking exercise. Participants who engaged in exercise-based cardiac rehabilitation maintained increased engagement in positive activity behaviors. Walking exercise is believed to improve cardiac output and reduce fatigue. Improved cardiac output can enhance tissue perfusion, leading to more energy production in the form of adenosine triphosphate (ATP) through metabolic processes. The longer the walking distance during exercise, the better the ventricular pump performance and oxygenation (Aritonang et al., 2018).

## 5. Implication and limitation

The present study showed that walking exercise improved functional capacity and reduced activity impairment in post-CABG patients; participants in the intervention group experienced a meaningful increase in METs after four weeks of walking exercise. Based on these findings, an important implication for nursing practice is the development of Standard Operating Procedures (SOPs) that guide the implementation of walking and leg-straightening exercises for post-CABG patients. These SOPs can support continuity of care by enabling patients to perform safe and effective rehabilitation exercises independently at their respective homes, potentially improving recovery and quality of life.

However, this study has some limitations. The 6-Minute Walk Test (6MWT) was conducted on a track shorter than the recommended 30 meters. Due to the need to accommodate the available space in participants' homes, the track was limited to 5 meters, requiring frequent turns. Some participants reported dizziness, and these conditions may have affected walking performance and introduced bias into the measurement of functional capacity. At present, no standardized guidelines exist for administering the 6MWT in home settings, highlighting the need for further research to establish reliable home-based assessment protocols.

## 6. Conclusion

Walking exercises performed three times a week for 50 minutes (including 10 minutes of warm-up, 30 minutes of walking exercises, and 10 minutes of cooling-down) can effectively improve functional capacity and reduce work and activity impairment in post-CABG patients. These findings suggest that nurses should play an active role in encouraging and educating post-CABG patients to incorporate regular walking exercise into their recovery routine. Nurses can support this by developing individualized exercise plans and providing clear instructions for home-based walking programs. Further studies with larger sample sizes are recommended to validate these findings and to support the continuation of exercises for patients during phase III of cardiac rehabilitation. Additionally, there is a need to establish a standardized 6MWT track suitable for home use. Health services should also consider providing online or remote monitoring to help patients maintain healthy habits after hospital discharge.

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## Author contribution

All authors ((IGP, TH, and PAN) contributed to the conceptualization, design of the study, and acquisition, analysis, and interpretation of the data. Additionally, all authors drafted and revised the manuscript until the final version was approved.

## Conflict of interest

All authors declared no potential conflict of interest.

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