EFFECT OF PHYSICAL THERAPY CARDIOVASCULOPULMONAL MODIFICATION (PACUM) TECHNIQUE ON FUNCTIONAL ACTIVITY, AND ACTIVITY DAILY LIVING, AMONG CARDIAC DISEASE PATIENTS

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Abstract

Background. Heart disease is a leading cause of death among adults and older people in Indonesia and the world. The most affected part of hearth disease survivor life is the limitation of performing functional activities in daily life. Physical therapy cardiovascular-pulmonary modification (PACUM) technique is a method to improve physical capacity and activity of daily living (ADL) among patients of people with cardiopulmonary problems. PACUM technique is an exercise method that consists of lying down to sitting, sitting to standing, and standing to walk that aims to reduce complaints of functional activity and increase ADL of Cardiopulomary disease patients. Whether Physical therapy cardiovascular-pulmonary modification technique may affect the chest pain, and activity daily living, among cardiac disease patients is worthy of being investigated. Objective. To examine the effect of physical therapy cardiovascular-pulmonary modification technique in improving functional activity and activity daily living among cardiac disease patients. Method. This research is a quasi-experimental approach with pre and post-test time series (three times and six times) with cross over design. As many as 22 people were recruited to participate with predetermined inclusion and exclusion criteria. Physical therapy cardiovascular-pulmonary modification technique was given for two weeks, three times a week, for 20 minutes of therapy for each session. Borg Scale (BS)0-,3 and Barthel Index (BI) as the primary outcome. Results. BS and BI scores were improved significantly after the six times of physical therapy cardiovascular-pulmonary modification technique treatment, with most of the subjects achieve minimum dependent or independent. Conclusion. Physical therapy cardiovascular-pulmonary modification technique given for six times is considered as effective in improving BS and BI of people with heart disease to be more independent.

Keywords*: heart disease, physical therapy, cardiovascular-pulmonary modification technique, functional activity, ADL*

Abstrak

Latar Belakang. Penyakit jantung merupakan penyebab utama kematian pada orang dewasa dan lanjut usia di Indonesia dan dunia. Bagian yang paling banyak terkena dampak dari kehidupan survivor penyakit jantung adalah keterbatasan dalam melakukan aktivitas fungsional dalam kehidupan sehari-hari. Physical therapy cardiovascular-pulmonary modification (PACUM) technique merupakan salah satu metode untuk meningkatkan kapasitas fisik dan activity of daily living (ADL) pada pasien penderita gangguan kardiopulmoner. PACUM Teknik merupakan metode latihan yang terdiri dari berbaring duduk, duduk berdiri, dan berdiri berjalan yang bertujuan untuk mengurangi keluhan aktivitas fungsional dan meningkatkan ADL pasien penyakit Kardiopulmonaris. Apakah PACUM teknik dapat mempengaruhi nyeri dada, dan aktivitas kehidupan sehari-hari, di antara pasien penyakit jantung layak untuk diselidiki. Objektif. Untuk mengetahui pengaruh physical therapy cardiovascular-pulmonary modification technique treatment dalam meningkatkan aktivitas fungsional dan aktivitas kehidupan sehari-hari pada pasien penyakit jantung. Metode. Penelitian ini merupakan penelitian eksperimental semu dengan pre dan post test time series (tiga kali dan enam kali) dengan cross over design. Sebanyak 22 orang direkrut untuk mengikuti dengan kriteria inklusi dan eksklusi yang telah ditentukan. Physical therapy cardiovascular-pulmonary modification technique diberikan selama dua minggu, tiga kali seminggu, selama 20 menit terapi untuk setiap sesinya. Skala Borg (BS) 0-, 3 dan Indeks Barthel (BI) sebagai

hasil utama. Hasil. Skor BS dan BI meningkat secara signifikan setelah enam kali physical therapy cardiovascular-pulmonary modification technique treatment, dengan sebagian besar subjek mencapai dependen minimum atau independen. Kesimpulan. Physical therapy cardiovascular-pulmonary modification technique yang diberikan sebanyak enam kali dinilai efektif meningkatkan BS dan BI penderita jantung agar lebih mandiri.

Kata kunci: penyakit jantung, terapi fisik, physical therapy cardiovascular-pulmonary modification technique, aktivitas fungsional, ADL

Introduction

Heart disease is a leading cause of morbidity and mortality with a stable prevalence, between 6.3% and 13.3%, since 1998(Fonseca, 2017) and contributing to about 30% of all deaths. Half of the hearth disease cases are estimated in Asia, the most populous continent in the world(Soenarta et al., 2020).

The prevalence of heart disease in Indonesia is 1.5%, with the distribution increases with age, the lowest prevalence is 0.1% at age <1 year, and the highest is 4.7% at age 75 and above. Based on the province, the lowest prevalence in East Nusa Tenggara was 0.7%, and the highest in North Kalimantan was 2.2%. South Sulawesi is ranked 16th with a prevalence of 1.5%, approximately the same as the national prevalence(Kemenkes, 2018). In addition to the risk of disability and death, people with heart disease experience a progressive decline in function and disability(Lelli et al., 2019).

Patients with heart disease had a disability with the most critical areas affected being life activities and participation in society (Mason-Garcia et al., 1990). Quality of life in patients with heart disease can be improved by home-based rehabilitation(Chen et al., 2018) or exercise-based cardiac rehabilitation (Tamuleviciute-Prasciene et al., 2018).

One type of exercise for patients with cardiac disease is the PACUM technique. This technique is an exercise that consists of lying to sitting, sitting to standing, and standing to walk that aims to improve physical capacity and ADL of patients with cardiopulmonary disease. The initial training zone was 10-20% (passive exercise, breathing exercise, bridging, therapeutic communication), 20-30% (sitting, balancing, stabilizing, therapeutic communication, without shortness of breath and chest pain), 30% -40 % (standing, supporting, therapeutic communication, and walking without shortness of breath and chest pain).

Materials and Method

Subjects

This research is a quasi-experimental approach with pre and post-test time series (3 times and six times) with cross over design. The subject of this study was heart disease patients who were treated at the PhysioSakti Clinic of Makassar that invited to participate in this study. As many as 22 subjects met the inclusion and exclusion criteria and agreed to participate in this study. The inclusion criteria included patients with heart disease accompanied by other conditions such as low back pain, herniated disc, stroke, diabetes mellitus, and kidney disease, aged 40 years or over, and experienced problems of limited ambulation, mobilization, and ADL difficulties. The exclusion criteria were patients with cognitive decline and communication difficulties. The ethics committee of Hasanuddin University approved the study protocol.

Intervention

All patients received physical therapy cardiovascular-pulmonary modification technique for two weeks, three times a week, according to written prescription, each session, each treatment last 20 minutes. PACUM Technique is an exercise method that consists of lying down to sitting, sitting to standing, and standing to walk that aims to increase Functional activity and increase ADL of Cardiopulomary disease patients.

Exercise day 1-2 consists of breathing exercises and bridging exercises for 20 minutes with a training zone of 10% - 20% maximum pulse rate. Exercise day 3-4 consists of breathing exercises, sitting exercises, balance exercises, and stabilization exercises for 20 minutes with a training zone of 20-30%

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maximum pulse. Exercise day 5-6 consists of standing exercises, balance exercises, stabilization exercises, and walking exercises for 20 minutes with training zones 30% - 40% maximum heart rate. During exercise, the patient's pulse is monitored using a heart rate monitor.

Outcomes Measure

BS and BI were assessed at baseline, three times of intervention, and after six times of receiving the intervention.

Statistical Analysis

Data was found to be not normally distributed according to the normality test. Wilcoxon and Friedman were used to comparing the baseline, three times intervention, and six times the result of BS, and BI. Categorical data were also analyzed to see how many subjects move to another category after receiving the intervention.

Result

Table 1
Baseline Characteristics of Subjects

Modification Barthel Index	Mean	Sig. (P)*
Baseline	69.82	0.000
Three times intervention	82.36	
Baseline	69.82	0.000
Six times intervention	91.09	
Three times intervention	82.36	0.000
Six times intervention	91.09	

The baseline characteristics of the subjects are presented in Table 1. Based on the age distribution, most subjects are in the age group 60 years old and over (63.6%) compared to younger groups. The number of subjects based on gender is male more than female. Based on the type of heart disease, most subjects, coronary heart disease (72.7%) compared to hypertension heart disease and pulmonary heart disease.

Table 2
The Effect of physical therapy cardiovascular-pulmonary modification technique on improving the Borg Scale (BS) of people with heart disease

Borg Scale	Mean	Sig. (P)*
Baseline	2.136	0.000
Three times intervention	1.295	
Baseline	2.136	0.000
Six times intervention	0.409	
Three times intervention	1.295	0.000
Six times intervention	0.409	

Data of Borg Scale (BS) score at baseline, three times intervention, and six times intervention is presented in Table 2. According to the Wilcoxon test, there is a significant difference ($p<0.01$) between baseline, three times intervention, and six times intervention on BS score with six times intervention score was significantly higher compared to 3 times intervention and baseline score.

Table 3.
The Effect of physical therapy cardiovascular-pulmonary modification technique on improving the ADL of heart disease patient.

Characteristics	N	%
Age		
40-59	8	36.4
≥ 60	14	63.6
Total	22	100.0
Gender		
Male	14	63.6
Female	8	36.4
Total	22	100.0
Type of Heart Disease		
Hypertension heart disease	4	18.2
Coronary heart disease	16	72.7
Pulmonary heart disease	2	9.1
Total	22	100.0

Data of Barthel Index score at baseline, three times intervention, and six times intervention is presented in Table 3. According to the Wilcoxon test, there is a significant difference ($p<0.01$) between baseline, three times intervention, and six times intervention on Barthel Index score with six times intervention score was significantly higher compared to 3 times intervention and baseline score.

Discussion

This study found that the PACUM technique was effective in improving physical capacity and functional activity in people with heart disease, which is six times the intervention is better than three times, and three times is better than baseline. This finding is in line with a study bySibilitz, Berg, and Rasmussen (Sibilitz et al., 2016) that cardiac rehabilitation is effective in improving the physical capacity of people with a post-operative heart valve. A study by dos Santos et al. (dos Santos et al., 2019) found that inspiratory muscle exercise in people with cardiac problems is effective in improving

functional capacity and quality of life after 12 weeks follow up. A study by Kirk et al(Kirk et al., 2014) showed that eight-week cardiac rehabilitation is feasible and effective in preventing further cardiac problems and reducing the risk of cardiovascular disease in people with cardiovascular problems.

A conflicting result was found in a study by Oliveira et al(Oliveira et al., 2014) that eight weeks of exercise-based cardiac rehabilitation is not enough to improve the function of cardiac in people with cardiac infarct problem. A study by Busch et al(Busch et al., 2012) showed that five days a week, cardiac rehabilitation in the form of resistance and balance training is effective in increasing physical capacity, reducing the risk of falls, and improving quality of life in very older people with cardiovascular problems. A study by Haddadzadeh et al(Haddadzadeh et al., 2011) showed that 12-week early exercise-based cardiac rehabilitation is effective in improving ejection fraction in people with cardiac disease.

The chest pain management in this study was conducted through physical capacity adaptation. Subjects were treated according to their training zone measured using targeted heart rate. When the subject experienced chest pain before reaching the target heart rate, the treatment was terminated. The treatment was continued after the chest pain subdued. The change in chest pain was observed according to when the chest pain and the targeted heart rate. The subject may experience chest pain before the target heart rate reached at the first time of treatment. However, after several times of treatment, the chest pain decrease and subject can reach their targeted heart rate without experience chest pain. It may indicate increases in the physical capacity adaptation of subjects.

This study has several limitations. This study was not a randomized controlled trial without a control group. It is not feasible for the researchers to conduct a randomized controlled study for this study as a small sample-sized of subjects who visit the clinic with heart diseases. This study had no control group as the intervention protocol is given to patients who were similar and not feasible to make one group without intervention. Comparing the intervention protocol in this clinic to another clinic may introduce some bias, such as subject characteristics, location, and clinical expertise. However, this study may give some insight into the effectivity of cardiac rehabilitation in one center to improve the physical capacity of people with heart diseases, mainly using the PACUM technique.

Conclusion

Physical therapy cardiovascular-pulmonary modification technique is effective in improving the physical capacity of patients with heart disease.

Conflict of Interest: The authors certify that they have no affiliation with an organization that may benefit financially or non-financially from the subject discussed in this study.

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