



## Comparative survey of the six-minute walk test on the treadmill and on the corridor in cardiac patients

*Estudo comparativo do teste da caminhada de seis minutos na esteira e no corredor em pacientes cardiopatas*

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### Abstract

**Introduction:** The six minute walk test (6MWT) is considered an important tool in the evaluation of physical capacity, monitoring and the effectiveness of treatment in cardiac patients. **Objective:** To compare the 6MWT on the treadmill and corridor in cardiac patients. **Methods:** Participated 24 cardiac patients, being 12 male and 12 female with  $56.7 \pm 12.7$  years age average, submitted to the six-minute walk test on the treadmill (6MWTT) and on the corridor (6MWTC) in an interval of seven days. The analyzed variables were: walked distance, respiratory rate (RR), heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and oxygen saturation (SatO<sub>2</sub>). **Results:** It was statistically significant difference in the comparison between the tests for the variables: walked distance, SBP, DBP and SatO<sub>2</sub> ( $p > 0.05$ ). The only statistically significant variable was the HR after the test application ( $p = 0.03$ ). **Conclusion:** After the two tests application, there was similarity in the variables: walked distance, SBP, DBP and SatO<sub>2</sub> with no significant statistical differences. Only the HR presented statistical significance between groups at the end of the tests.

**Keywords:** Walking. Exercise test. Heart diseases.

## Resumo

**Introdução:** O teste da caminhada de seis minutos (TC6) é considerado uma ferramenta importante na avaliação da capacidade física, monitorização e efetividade do tratamento de indivíduos cardiopatas. **Objetivo:** Comparar o TC6 realizado na esteira e no corredor aplicado em pacientes cardiopatas. **Método:** Participaram do estudo 24 pacientes cardiopatas, sendo 12 do sexo masculino e 12 do feminino, com idade média de  $56,7 \pm 12,7$  anos, submetidos à aplicação do TC6 na esteira ergométrica (TC6E) e no corredor (TC6C), em um intervalo de 7 dias. As variáveis analisadas foram: distância percorrida no teste, frequência respiratória (FR), frequência cardíaca (FC), pressão arterial sistólica (PAS), pressão arterial diastólica (PAD) e saturação de oxigênio ( $SatO_2$ ). **Resultados:** Não houve diferença estatisticamente significativa na comparação entre os testes nas variáveis: distância percorrida, FR, PAS, PAD e  $SatO_2$  ( $p > 0,05$ ). Somente a variável FC após a realização do TC6E obteve aumento significativo ( $p = 0,03$ ). **Conclusão:** Após a aplicação dos dois testes, houve semelhança nas variáveis: distância percorrida, FR, PAS, PAD e  $SatO_2$ , não havendo diferenças estatísticas significantes. Apenas a variável FC apresentou significância estatística entre os grupos ao final dos testes.

**Palavras-chave:** Caminhada. Teste de esforço. Cardiopatas.

## Introduction

Cardiovascular diseases (CD), specifically coronary heart disease are the leading cause of death around the World. According to the Brazilian Ministry of Health, there are approximately 260,000 myocardial infarcts (MI) per year (1). The consequence of this fact is a significant increase in health care costs, including hospitalization, medicines, laboratory tests, outpatient visits and early retirement (2).

Early diagnosis and effective treatment reduce the mortality rate and associated costs, which justifies the importance to establish and disseminate the appropriate guideline management of this disease (3).

The patients with CD report more subjective dyspnea sensation when compared to healthy subjects of similar age and weight. These patients also present atrophy and respiratory muscles deconditioning, culminating in physical and social limitations which decreases the quality of life of these individuals (4).

The assessment of physical capacity is performed with functional physical tests, as the six-minute walk test (6MWT), which is applied with the purpose to complement the dynamic evaluation of CD subjects, analyze the effectiveness of treatment and to establish prognosis (5, 6, 7, 8, 9).

The 6MWT is a submaximal exercise test that resembles the patient's daily activities, allowing an objective assessment of the physical condition (6, 10, 11). It is based on a routine activity, the walk,

and easily accepted by the patients (12, 13, 14). The 6MWT is being an increasingly used form of adjunct or alternative evaluation of cardiac patients (13).

The 6MWT is considered a low cost and well tolerated option to evaluate the physical capacity, making possible the patients to determine their own speed and the need for pauses, which is an additional advantage in elderly patients (9, 15, 16, 17, 18, 19).

This study aimed to compare the 6MWT using treadmill (6MWTT) or corridor (6MWTC) in cardiac patients.

## Methods

It was performed an experimental, descriptive and quantitative survey at the Integrative Medical Care Nucleus (NAMI) of the University of Fortaleza (Unifor), in Fortaleza (CE), Brazil, between January and August of 2010.

This study was approved by the institution ethics committee with the approval number 0022/10, and followed the ethical principles for human research of Brazilian National Health Council Resolution 196/96 (21) and all patients gave written informed consent.

The sample consisted of 24 individuals, older than 18 years, both genders, with clinical diagnosis of heart disease and/or hypertension, which were clinically stable. The patients were submitted to the 6MWT on a treadmill (6MWTT) and corridor (6MWTC) at an interval of 7 days, always in that order.

Initially, it was performed an evaluation of personal and clinical data through a clinical evaluation sheet developed through the researchers. The following hemodynamic parameters of the patients were verified at rest: respiratory rate (RR), heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and oxygen saturation (SpO<sub>2</sub>).

Prior to achievement of the study protocol, patients were instructed about the account of test application, to not eat within two hours before the test, not perform an intense physical exercises and the use of comfortable clothing and shoes.

All patients remained at rest for 15 minutes to stabilize vital parameters at baseline levels before the 6MWTT and 6MWTC application.

The 6MWTC followed the guidelines established by the American Thoracic Society (ATS) (22), where patients were encouraged to walk at their own pace, on plane surface of 30 meters for a period of six minutes. At the end of the test it was recorded the traveled distance, and before and after the test was measured and recorded the following variables: RR, HR, SBP, DBP and SpO<sub>2</sub>.

The 6MWTT was performed without inclination, through the use of a professional treadmill (RT150 – Movement®), and as the 6MWTC the patients were instructed to walk as quickly as possible during 6

minutes. The difference between the first test was the increase and/or decrease in speed by the researcher who monitored the activity, respecting the patients tolerance and the distance traveled was informed of the treadmill's console. At the end of the test, it was also recorded the same variables that were used in 6MWTC.

The results were analyzed using the Statistical Package for the Social Sciences (SPSS) version 17.0 and presented by mean ± standard deviation of the values obtained in the 6MWTT and 6MWTC. To analyze the variables it was performed the t student test and ANOVA for repeated measures, being adopted significance level of 5% (p < 0.05).

## Results

It was evaluated 24 subjects, being 12 male and 12 female, with a mean age of 56 ± 12.7 years.

Table 1 shows no statistically significant difference in the comparison between 6MWTT and 6MWTC in the variables: distance traveled, RR, SBP, DBP and SpO<sub>2</sub>.

Heart rate was the only variable that presents significant difference after the application of the 6MWTT when compared to the 6MWTC (p = 0.03) (Table 2).

**Table 1** - Mean and standard deviation of respiratory rate (RR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) in 24 cardiac patients submitted to the six minute walking test in the treadmill (6MWTT) and in the corridor (6MWTC)

Variáveis	6MWTT		p	6MWTC		p
	After	After		Before	Before	
Rr (ipm)	17.25 ± 2.41	15.83 ± 2.12	0.14	21.08 ± 3.05	20.92 ± 1.62	0.87
Sbp(mmHg)	135 ± 26.4	138.33 ± 20.27	0.73	158.33 ± 31.57	135.83 ± 25	0.6
Dbp(mmHg)	82.50 ± 10.12	88.33 ± 21.24	0.48	90 ± 15.95	77.50 ± 17.12	0.7

Source: Research data.

**Table 2** - Mean and standard deviation of heart rate (HR) in 24 cardiac patients submitted to the six minute walking test in the treadmill (6MWTT) and in the corridor (6MWTC)

Variable	6MWTT		p	6MWTC		p	6MWTT		6MWTC		p
	After	After		During	During		Before	Before	Before	Before	
HR (bpm)	83.42 ± 20.10	77.75 ± 15.48	0.44	102.92 ± 19.94	105 ± 16.44	0.78	105.33 ± 20.72	79.92 ± 15.81			0.03*

Source: Research data.

## Discussion

The 6MWT is an independent survivor predictor in patients with severe chronic obstructive pulmonary disease (COPD), heart failure and pulmonary hypertension. In these diseases the traveled distance is a better predictor of mortality when compared to the others traditional markers of disease's gravity (7).

We observed that as we find in the literature (6, 7, 8, 9, 10), this study results shows that 6MWT could be increasingly used as coadjutant or alternative to evaluate cardiac patients who are submitted to cardiac rehabilitation.

Oliveira Junior et al. (14) follows during 4 years patients with cardiac failure and in the survey's conclusion the authors asserts that the 6MWT distance traveled was identified as an independent variable and a strong mortality and hospitalization predictor in patients with ventricular dysfunction. Based on the obtained results, the distance traveled in the test was divided into levels: level 1 for those who walked less than 300 meters; level 2, between 300 and 375 meters; level 3 between 375 and 450 meters and 4 level more than 450 meters. This study shows that the mortality decreases as the traveled distance increased.

When compared the results found in this study in relation to the variable traveled distance, it was observed satisfactory results, reaching an average distance traveled of 478 meters in the 6MWTT and 508 meters in the 6MWTC.

In the comparison of traveled distance in 6MWTT and 6MWTC, it was observed no statistical difference ( $p = 0.24$ ), although the patients have walked in 6MWTC an average of 30 meters higher than 6MWTT. This result corroborates with Redelmeir et al. (23), which showed that 54 meters is the minimum difference between the two tests in order to have a clinically significant difference (18).

The results founded by Stevens et al. (24), which was evaluated 9 men and 12 women with a mean age of  $65 \pm 10.9$  years, comparing the 6MWTT and 6MWTC in patients with COPD has similar results to the present study, where the patients that completed the 6MWTC walked a 14% greater distance while the present study this percentage was 6%.

## Conclusion

We concluded that in the comparison of 6MWTT and 6MWTC application was observed similar results in RR, SBP, DPB and  $SpO_2$ , with no significant statistical difference. Only the HR presents statistical difference after the tests.

The results of this study showed no difference on the definition of best method, which can be chosen that best suits to the institutions reality or patient's comfort. There are few studies about the 6MWT in treadmill and in corridor in cardiac patients, thus we expect that this research becomes subsidy for new studies about the effectiveness of the test.

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