# Comparison of 6 Minute Walk Test (6mwt) and 6 Minute Step Test (6mst) and its Effect on \% Maximal Heart Rate in Football Players: An Observational Study <br> Rutika Tavargeri ${ }^{1}$ and Nisha Shinde ${ }^{2}$ <br> ${ }^{1}$ College of Physiotherapy, Smt. Kashibai Navale Medical College and Hospital, Narhe, Pune, India, <br> ${ }^{2}$ College of Physiotherapy, Dept. of Cardiovascular and Respiratory Physiotherapy, Smt.Kashibai Navale Medical College and Hospital, Narhe, Pune, India. 

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#### Abstract

The Objective of the study was to compare the $\%$ maximal heart rate achieved by the subjects at the end of each test to verify whether or not $\%$ maximal heart rate achieved by post 6 minute step test is more than 6 minute walk test 6 MWT and 6 MST were performed according to the American Thoracic Society guidelines. Blood Pressure, Respiratory Rate, Oxygen Saturation, Heart Rate and \%Maximal Heart Rate were measured and recorded. The Cross Sectional Observational Study performed on Local Football Club, Pune. The heart rate post 6MWT increased significantly but within normal range (p <0.04).The mean \% MHR pre-test was $38 \%$ and post-test was $42 \%$. The heart rate post 6 MST increased significantly too but within normal range. The mean $\% \mathrm{MHR}$ pre-test was $37 \%$ and post-test was $47 \%$. ( $\mathrm{p}<0.01$ ). As there is a significant increase in the $\%$ MHR post 6 minute step test in football players, it can be concluded that the two tests i.e. 6 minute walk test and 6 minute step test are not interchangeable in the following population. This also concludes that the 6 minute step test can be used to increase the cardiovascular endurance in Football Players.


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## Introduction

Cardio respiratory function can be evaluated using maximal aerobic tests involving a cycle Ergometer or treadmill, and sub maximal tests, such as walking, stair climbing, shuttle walk test or step tests. These tests are considered to be an essential component for the evaluation of fitness level. Both walking and step tests are considered to be low technology, and have been widely performed in patients with respiratory disease to inform prognostic and therapeutic management due to their ease of execution [1,6]. Evidence suggests that the maximal heart rate achieved by healthy sedentary subjects is more in 6 minute step test than 6 minute walk test. As footballers undergo cardiovascular endurance training, a comparison can be made to observe the maximal heart rate achieved by them post these tests [1,2,3,]
For 6 Minute Walk Test - (Tests described according to ATS guidelines)
Introduction- 6 MINUTE WALK TEST (6MWT) is sub maximal exercise walk test used as prognostic test. 6MWT is self-paced test, that a patient is probably less likely to push himself beyond his endurance. The ease of performing a 6minute walk test (6MWT) is use full for any population.

## Preparation of the Subject

Instruct the subject to dress comfortably, wear appropriate footwear and to avoid eating for at least two hours before the test.

The subject should rest for at least 15 minutes before beginning the 6 MWT .

## Preparation of the Therapist

Mark the distance of the hall by every one meter for about 15 meters / 30 meters.

The therapist has to collect all the equipment's require for the test

Ensure to obtained a medical history from all the subjects and have taken into account any precautions or contraindications to exercise testing.

## Environmental Conditions

The room where to conduct the test should be large enough to accommodate all the equipment necessary. It should be well lighted, clean, and well ventilated with temperature and humidity control. The track should be flat, with minimal obstacles.

A ribbon measuring 10 meters is used with cones at both ends to mark the two points

## Instructions to Subject

## Beginning of the Test

You are now going to do a six-minute walking test. The object of this test is to walk as quickly as you can for six minutes so that you cover as much ground (distance) as possible. You may slow down if necessary. You will be regularly informed of the time. Your goal is to walk as far as possible in six minutes.

Please do not talk during the test unless you have a problem or I ask you a question. You must let me know if you have any chest pain or dizziness or cramps .When the six minutes are up I will ask you to stop wherever you are.

[^0](Begin the test by instructing the patient to "Start walking now.")
During The Test - (Monitor the subject for signs and symptoms)

Use the following standard encouragements during the test.

At every minute - give the time completion command along with simple command like good, doing well.

Count the laps to measure the total distance.

## At the End of 6 Min Walk Test

Put a mark on to the spot where the subject reached at the end of $6^{\text {th }}$ minute and calculate the laps in meters

Make the patient sit. Measure the parameters at the end of test, followed by $3^{\text {rd }}$ minute and $6^{\text {th }}$ minute.

## For 6 Minute Step Test

Introduction -The American Thoracic Society formed a new 6 minute step test using the basis of step tests formed by the ACSM. This step test is also a submaximal test which will be performed on normal individuals

## Preparation of the Subject

Instruct the subject to dress comfortably, wear appropriate footwear and to avoid eating for at least two hours before the test. The subject should rest for at least 15 minutes before beginning the 6MST

## Preparation of the Therapist

Obtain a step with the height of 15 cm , width of 65 cm and length of 30 cm .

The therapist has to collect all the equipment's required for the test

Ensure to obtain a medical history from the patient and have taken into account any precautions or contraindications to exercise testing

## Instructions to Subject

At the Beginning of Test - (To The Subject)
You are now going to perform a 6 minute step test. It will last for a total time of 6 minutes

You are supposed to step up and down the provided step as fast and as many times as you can within 6 minutes

You may slow down if necessary. You will be informed regularly about the lapsing time

You are supposed to immediately inform about any discomfort, cramps, and giddiness if occurring during the test. You may change your leg while performing the test but your arms will have no support

## During the Test

Encourage the subject to complete test. Terminate test if patient has any problems

Pre-test calculation of vitals must be marked. Use a pedometer to calculate number of steps performed within 6 minutes

## After the Test

Ask the subject to sit down and relax. Check the vitals
POST TEST -
Pre and post-test \% maximal heart rates are recorded.
Both these values are compared after 6 minute walk test and 6 minute step test
Aims and Objectives
Aim -To perform 6-minute walk test (6MWT) and 6-minute step test (6MST) on footballers and compare the \% maximal heart rate at the end of each test.

## Objectives -

1) To compare the $\%$ maximal heart rate achieved by the subjects at the end of each test.
2) To verify whether or not $\%$ maximal heart rate achieved post 6 minute step test is more than 6 minute walk test.

## Detailed Research Plan -

Study Area - PFC Football club, Pune
Study Design - An observational study
Sample size - 30 (arbitrary to the test)
Sample Method - convenient Sampling
Inclusion Criteria
All the players of the football club with age Group - 18 to 25
Exclusion Criteria - Players having following problems will be excluded

- Asthma
- Recent fractures
- Unwilling to participate

Materials Required

- 2 cones to mark points
- A ribbon marking 30 meter distance
- Sphygmomanometer
- Stethoscope
- Pulse Oxymeter
- Pen and paper

Outcome measure
\% MHR (Percentage of maximal heart rate)

## Procedure

The approval from the Principal of SKNCOPT was taken. The approval from the Ethical committee was taken. Subjects were selected according to the inclusion criteria. Consent form and information sheet were provided and filled. Pre assessment to the tests was conducted and documented

The following pre assessment test was done in all subjects
-Heart Rate (manually by palpating the radial pulse)
-Respiratory Rate (manually by observing the chest)
-Blood Pressure (manually by a sphygmomanometer and stethoscope)
-SPO2 (by using a pulse oxymeter)
-In account any precautions or contraindications to exercise testing.

## Results

The heart rate post 6 MWT increased significantly but within normal range. The mean \% MHR pre-test was $38 \%$ and post-test was $42 \%$. The heart rate post 6 MST increased significantly too but within normal range. The mean \%MHR pre -test was $37 \%$ and post-test was $47 \%$.

The data was analysed using the Primer of Biostatistics App.
Table shows Comparison \%MHR pre and post 6 minute walk test and 6 minute step test

| VALUE | MEAN (IN \%) | STDEV | P VALUE |
| :---: | :---: | :---: | :---: |
| 6MWT |  |  |  |
| PRE | 38 | 2.92 | $>0.10$ |
| POST | 42 | 1.86 | 0.0425 |
| 6MST |  |  |  |
| PRE | 37 | 2.39 | 0.06 |
| POST | 47 | 3.67 | 0.01 |
| POST |  |  |  |
| 6MWT\&6MST | 42 | 1.86 | 0.04 |
| 6MWT | 47 | 3.67 | 0.01 |
| 6MST |  |  |  |



Graph 1. Shows Comparison \%MHR pre and post 6 minute walk test


Graph 2.Shows comparison of \%MHR pre and post 6 minute step test


Graph 3. Comparison of \%MHR post 6 minute walk test and 6 minute step test

## Discussion

It has been reported previously that trained subjects could present different results for distance walked and HR at the end of the 6MWT compared with sedentary subjects Thus, taking football players as subjects helped in comparing the parameters post test to determine the changes in \%MHR. It has been observed that in COPD patients and sedentary subjects, 6 MWT and 6 MST are not interchangeable. [1,2.9].

This study was carried out in order to investigate the feasibility of using the 6MST and 6MWT in football players and compare the maximal heart rate during both tests, by correlating the functional performance obtained. We could observe that all players assessed in this study completed the test properly, without pausing during the six minutes, without sudden drops in Oxygen Saturation Thus, the same way that
the 6MST and the 6MWT proved to be reliable and reproducible in patients with pulmonary diseases_is possible to say that it is a low cost method $[6,7,8]$

The parameters describes the physiological variables measured in the beginning and end of the 6MWT and 6MST. It can be observed that in the 6MWT performance the football players presented maintain in the $\mathrm{SpO}_{2}$ variable similar to in the 6 MST , demonstrating hence that both tests caused no desaturation, BP analysis demonstrates that, in both tests this variable significantly increased but within the normal range however, in a more intense manner in the 6MST. The Borg RPE during the tests presented very close values, evidencing increase in the dyspnoea sensation during its performance; however, a more significant variation was observed in the 6MST. Nevertheless, when the data of the physiological alterations and of the \% MHR. Between the 6MST and the 6 MWT was compared, it was observed that the heart rate variation, obtained statistically significant.

There is significant increase in the $\%$ MHR post 6 minute step test in football players, it can be concluded that the two tests i.e. 6 minute walk test and 6 minute step test are not interchangeable in the following population. This also concludes that the 6 minute step test can be used to increase the cardiovascular endurance in football players Evidence suggests that the maximal heart rate achieved by healthy sedentary subjects is more in 6 minute step test than 6 minute walk test. In present study we also have observed the same findings As footballers undergo cardiovascular endurance training, a comparison can be made to observe the maximal heart rate achieved by them post these tests.

## Conclusion

The results of the present study revealed that the 6SWT and 6SWT may be used in the evaluation of the cardiovascular endurance in football players, being submaximal test of easy application and low cost which does not require the use of sophisticated devices. However, As there is a significant increase in the $\%$ MHR post 6 minute step test in football players, it can be concluded that the two tests i.e. 6 minute walk test and 6 minute step test are not interchangeable in the following population. This also concludes that the 6 minute step test can be used to increase endurance in football players.

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## Conflict Of Interest

Conflict of interest declared none.
Ethics approval: Smt.Kashibai Navale Institutional Ethics Committee(s) approved this study. All participants gave written informed consent before data collection began.
Competing interests: Conflict of interest declared none.

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