



COMPARISON OF CARDIOVASCULAR FITNESS MEASURED FROM TWO SUBMAXIMAL WALKING TESTS IN NORMAL HEALTHY INDIVIDUALS

Physiotherapy

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ABSTRACT

Introduction & Aim: Determination of cardiorespiratory fitness in terms of maximum oxygen uptake ($\text{VO}_2 \text{ max}$) is restricted within the laboratory because of its exhausting and difficult experimental protocol. The six minute walk test (6MWT)⁽⁴⁾ and three minute walk (3MWT) tests both are very reliable and valid field tests to measure the cardiorespiratory fitness of individuals. Aim of the study was objective was to analyze whether there is a significantly difference in $\text{VO}_2 \text{ max}$ values obtained from two submaximal walking tests or not. **Methodology:** Two walking tests were carried out same day In 50 subjects and 30min rest prior and between each test was given. Distances covered, Oxygen saturation, heartrate, respiratory rate and degree of breathlessness (modified Borg scale) were registered at baseline, immediately after test, 1min, and after 3 min after test to check for the recovery. **Conclusion:** There is significant difference in $\text{VO}_2 \text{ max}$ calculated from both the tests. The 3MWT better estimates $\text{VO}_2 \text{ max}$ than 6min walk test.

KEYWORDS

3 minute walk test, 6 minute walk test , submaximal exercise testing, normal healthy individuals.

INTRODUCTION

Determination of cardiorespiratory fitness in terms of maximum oxygen uptake ($\text{VO}_2 \text{ max}$) is restricted within the laboratory because of its exhausting and difficult experimental protocol⁽¹⁾. It is therefore desirable to find simple procedure for evaluation of $\text{VO}_2 \text{ max}$ in large number of population, especially on field and without well equipped laboratory.⁽²⁾ The ability to walk for a distance is a quick and inexpensive measure of physical function, and an important component of quality of life, since it reflects the capacity to undertake daily activities⁽³⁾.

Walk tests described in the literature range in duration from 1 to 12 minutes, amongst Six-Minute Walk Test (6MWT) is most frequently used.

The six minute walk test⁽⁴⁾ and three minute walk (3MWT) tests both are very reliable and valid field tests to measure the cardiorespiratory fitness of individuals⁽⁵⁾ The distance walked in 6 min(6MWD) is reduced by several types of diseases, including obstructive lung disease, heart failure, arthritis, and neuromuscular disease^(6,7) for diseased people whereas 3MWT has good reliability⁽⁸⁾ and can be use as a short walking test in the functional evaluation of COPD patients in an out-patient environment or in patients having very low functional activity levels.

Our objective was to analyze whether there is a significantly difference in $\text{VO}_2 \text{ max}$ values obtained from two submaximal walking tests or not.

MATERIAL & METHODOLOGY:

The 6-min walk test was conducted according to a standardized ATS guidelines⁽⁹⁾ 3MWT was performed same as 6 min walk test.

50 Normal healthy individuals selected according to the inclusion and exclusion criteria and after ethical approval and written consent, both the tests was performed and $\text{VO}_2 \text{ max}$ was calculated and compared. Inclusion criteria: normal young healthy individuals of 18-24 yrs of age, having normal BMI. Exclusion criteria: subjects having known musculoskeletal, cardiovascular, neurological, respiratory disorders, metabolic disorders, smokers.

Two walking tests were carried out same day In 50 subjects and 30min rest prior and between each test was given. Distances covered in periods of 3 and 6min were measured . Oxygen saturation, heartrate, respiratory rate and degree of breathlessness (modified Borg scale) were registered at baseline, immediately after test, 1min, and after 3 min after test to check for the recovery.

Prediction equation for 6MWT⁽⁴⁾

$$\text{VO}_2 \text{ max (ml/kg/min)} = 0.03 * \text{distance (meters)} + 3.98$$

Prediction equation for 3MWT⁽⁵⁾

$$\text{VO}_2 \text{ max (ml/kg/min)} = 37.501 + 0.463(\text{gender}) - 0.195(\text{age}) - 0.589(\% \text{ of fat}) + 0.053 * 3\text{MWD}$$

0=woman, 1=man

STATISTICAL ANALYSIS & RESULT:

Statistical analysis was done using SPSS software version 29.

Mean $\pm$ SD of $\text{VO}_2 \text{ max}$ calculated from 6MWT and 3MWT was 20.66 $\pm$ 3.68 ml/kg/min and 38.31 $\pm$ 1.36 ml/kg/min respectively.

Table:1 $\text{VO}_2 \text{ Max}$ From Two Tests:

	Mean $\pm$ SD	U value	P value
6MWT	21.27 $\pm$ 3.61	0.00	<0.001
3MWT	38.31 $\pm$ 1.63		

Table 2: Post Test Vitals

Post Test vitals	HR (Bpm)	RR (Rpm)	RPE
6MWT	114.3 $\pm$ 10.25	27.33 $\pm$ 4.69	9.53 $\pm$ 1.00
3MWT	124.9 $\pm$ 8.79	29.8 $\pm$ 4.58	12.66 $\pm$ 1.58

DISCUSSION:

Strijbos et al already carried The use of short test in out-patient rehabilitation programs in COPD patients⁽¹⁰⁾

The 3-minute walk test is a non-resource intensive, simple procedure with applicability in most Emergency Departments for discharge decisions in patients with cardiopulmonary conditions. Multi centre studies are being planned to validate these findings and establish guidelines for admission and discharge of patients with CHF or acute exacerbation of COPD⁽¹¹⁾

Present study also suggest that the 3min walking test is a submaximal strength test that is simple and easy to carry out both in the hospital as well as outpatients environment, with a low cost 3 MWT is also assesses a patient's ability to ambulate at a self-selected speed, covering as much distance as possible in three minutes, while monitoring heart rate and shortness of breath.

Findings from this study show that the mean distance covered during 6-MWT was 368.87 $\pm$ 48.33 m This is lower compared to reported values among apparently healthy subjects in some previous studies.⁽¹²⁾

Tsang et al, reported a range of 606 m and 645 m for similar age group while Gibbons, et al. reported a range between 699 m and 800 m for apparently healthy individuals⁽¹³⁾ Similarly, the distance covered during the 3 MWT is 190.56 $\pm$ 29.50 m. Findings from previous study showed that the 3-MWT has good and acceptable validity concurrent validity ($r=0.97$) The 3-MWT has good convergent validity with 6-MWT, speed, and $\text{VO}_2 \text{ max}$ using Pearson correlation coefficients⁽⁸⁾

$\text{VO}_2 \text{ max}$ values found from 6MWT and 3MWT was 21.27 $\pm$ 3.61 and 38.31 $\pm$ 1.63 respectively. The reason behind this might be for 3 MWT patient gives his best effort because of short duration of test. But in 6 MWT patient is psychologically prepared to walk for 6 min, so subject paces his speed accordingly to carryout and complete the 6 min test. SO the paced speed can be the reason behind not getting maximum $\text{VO}_2 \text{ max}$ values. Still more research should be done with larger sample size to justify the difference.

Post test vitals from both the test don't show much significant

differences and Bohannon, et al. reported significant correlation between 6-MWT and other walk tests of shorter duration⁽¹⁴⁾

CONCLUSION:

There is significant difference in VO_2 max calculated from both the tests. The 3MWT better estimates VO_2 max than 6min walk test.

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