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Short Communication

Comparison of Treadmill Based and Track Based Rockport 1 Mile Walk Test for Estimating Aerobic Capacity in Healthy Adults Ages 30-50 Years

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ABSTRACT

The aim of the present paper was to compare the treadmill based submaximal test with the standard field based submaximal test to estimate aerobic power in Indian middle aged population. Study type is correlational study based on cross-sectional survey. 40 subjects aged 30-50 years were randomly selected following specific inclusion and exclusion criteria. 1-mile walk test was conducted 3 times (2 times on treadmill and 1 time on track) with at least 4 days gap in-between the tests. Aerobic power was calculated using standard formula. Data was analysed using IBM-SPSS software (version 21.0). Treadmill based tests estimated higher aerobic power than track based test. There was a moderate correlation between track based and treadmill based aerobic power estimation (r 0.640). The relationship was excellent between the treadmill based tests (r 0.960). This study shows treadmill based 1-mile walk test is a reproducible test in Indian middle aged population.

Key Words: Walk test, Exercise test, Oxygen consumption, Middle aged, Human

INTRODUCTION

Cardiovascular endurance is an important component of an individual fitness and VO_2max estimation is widely considered to be an excellent indicator of cardiorespiratory fitness. [1] This can be measured in two ways: direct and indirect methods. However, direct measurement is the most accurate but has several drawbacks (i.e) expensive, time consuming hence may not be suitable for population based studies. [2] Moreover, direct assessment of VO_2 max requires a maximal or near-maximal effort from the subject, which is often difficult to elicit from individuals with low cardiorespiratory fitness especially middle and older population. The need for direct supervision by a physician when evaluating older individuals or those with known cardiovascular disease or associated risk factors adds to the challenge of administering maximal exercise tests to assess VO_2. Submaximal tests like step tests, walk and/or run tests are useful to measure VO2max in these individuals. [2] Many indirect methods of measuring VO_2max using submaximal tests has been developed [2,3] but the advantages and limitations of these tests has been reported by Sartor et al. who highlighted the importance of repeatability of submaximal tests in these population to be studied. [4]

Developed by Kline et al. Rockport 1-mile walk test is one of common method to estimate VO2 max in different age group. [5] A modification of Rockport test was suggested by Widrick et al., 1992 that performing this test on laboratory as well as

on field would increase its utility. Performing Rockport 1 mile test on treadmill would improve close subject monitoring and allows testing when not having access to measured miles also, controlled lab environment would improve the reliability and repeatability. Since it is done in track, environmental factors could affect the estimation which could be prevented by treadmill based estimation. Reliability of treadmill based 1-mile walk test was first reported by Widrick et al. [6] subsequently published in Indian literature too. [7] But it has to be seen whether it can be administered in Indian middle aged population or not. So the purpose of this study is to determine whether Rockport 1 mile testing on treadmill is better method of estimating VO_2 max than standard method of Rockport 1 mile walk test in Indian population.

MATERIALS AND METHODS

Forty subjects (20 male and 20 females) age ranging from 30 years to 50 years were selected by convenient sampling from the neighbourhood. The participants were excluded if they had history of cardiovascular disease; back pain from last 1 months; knee pain from last 1 month and are on blood pressure medications and had no history of acute or chronic medical condition. The qualified participants were asked to read and sign an informed consent form.

Each selected participant were asked to complete 3 exercise tests: 1 mile brisk walking on treadmill on baseline and after rest of 4 days one mile brisk walking on the track followed by one mile brisk walking on treadmill again with a gap of 4 days . Time taken to complete the distance and heart rate (HR) at the end of tests were recorded along with age and sex. HR was measured with a pulseoxymeter and the time to complete the distance was noted with a stop watch. Each test was conducted on separate day with at least 4 days gap in between the tests to eliminate possible fatigue effects. [8]

On baseline, body weight to nearest to 1.0 kg and height to the nearest to 1.0 cm were measured. Participants were instructed to take good sleep (at least 6-8 hrs) and to avoid too much food, caffeine, tobacco products or alcohol for 3 hours prior to testing. [2] Participants were also asked to avoid strenuous exercise 12 hrs prior to testing.Out of the forty subjects 2 females were not able to complete the treadmill test on Day 1 because of exertion so were excluded from the study.

Following a familiarization trial on day 1 each subject was asked to walk briskly on electromechanical flat treadmill [Bodyfit, India] for 1-mile. On day 5, the subjects were asked to 1-mile brisk walk on a track and a Pedometer was used to measure the distance. The subjects were reminded to maintain the speed throughout the test without running or jogging. On day 10 the subjects completed the testing after walking on treadmill again for 1 mile.

Aerobic power was calculated using following formula:

VO2max [$ml.kg^{-1}.min^{-1}$] =132.853 - 0.0769 (weight in pounds) - 0.3877 (age in years) + 6.315 (1 for male; 0 for female) - 3.2649 (time in minutes) - 0.1565 (heart rate in $beats.min^{-1}$)

Statistical Analysis

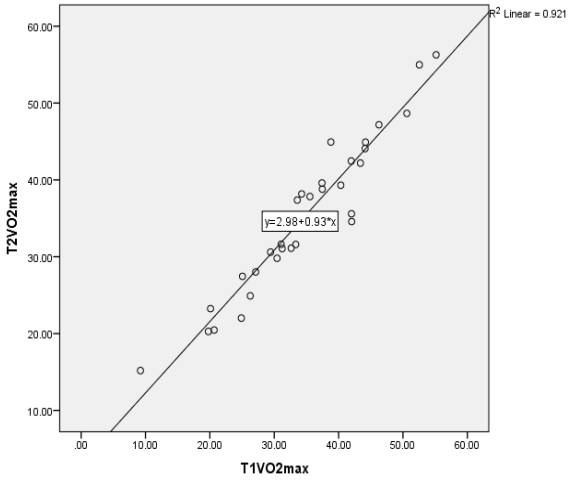
Data was analysed using IBM-SPSS software (version 21.0). Pearson Co-relation was used to determine the co-relation between the variables.

RESULTS

Mean (standard deviation) of VO2 max on 1st time (T1) and 2nd time (T2) on treadmill was 34.68 (9.99) $ml.Kg^{-1}.min^{-1}$ and 35.21 (9.67) ml.Kg.min-1 respectively suggesting no significant difference between the readings. However, track based value for VO2 max was significantly lower [22.29 (14.66)] than treadmill based. 4 female participants reading were excluded as their VO2 max was too low (negative readings).

An excellent correlation exists (r 0.960) between 1st and 2nd treadmill based value for VO2 max (Figure 1), but the level

of correlation decreased when the values were correlated with track based VO2 max (r 0.640 for T1 and 0.646 for T2).



DISCUSSION

The objective of this paper was to see whether treadmill based 1-mile walk test is a better way of estimating VO_2 max than standard track based method in middle aged Indian population. The results showed that there is excellent correlation between two trails of treadmill walking whereas moderate correlation is observed between treadmill based and track based walking tests. Treadmill based walking test estimates higher VO2 max than track based walk test.

Pober et al., 2002 studied the correlation between treadmill based 1-mile walk test and actual VO2 max through direct method in middle and old age population (40-79 years). [9] They found moderate correlation (r 0.80) between the two methods. Treadmill based 1-mile walk test value of the present study (r 0.960) is similar to track based testing on Malaysian youth (age 19-25 years) [8] and US old aged (age 50-69 years) women. [10]

During the testing on track it was observed that participants took more time to complete the distance due to varying their pace of walking even after instructing them to walk briskly, whereas in the treadmill test, the speed remained constant. Advantage of treadmill based test is that the values of VO_2max calculated were as per standard norms for middle aged population.

We assumed that since both time and HR are in equation for calculation of VO_2max, intensity of effort would not influence the VO2 max estimation as latter has negative association with HR (i.e. if intensity of effort high, individual would finish short duration with higher HR). But the results of this study suggests that whenever the duration of completing the distance exceeds 20 minutes, it affects the value of VO_2 max greater than the end HR. Hence while selecting the speed of treadmill, it should be 5 $Km.hr^{-1}$ at starting point and speed should be adjusted with HR (120 to 160 $beats.min^{-1}$) in this population. If the HR is above 160 $beats.min^{-1}$ speed of the treadmill should be reduced and if it is below 120 $beats.min^{-1}$ speed of the treadmill should be increased to get the appropriate values of VO_2max of the individual. Thus, initial selection of speed followed by adjusting the speed according to HR is important for appropriate estimation of VO_2 max.

CONCLUSION

Treadmill based 1 mile walk test is a reliable method to estimate VO2 max in middle aged Indian population. It could be used as indirect method to assess aerobic fitness in large scale, population based studies.

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