International Journal of Yoga, Physiotherapy and Physical Education
ISSN: 2456-5067; Impact Factor: RJIF 5.24
Received: 03-06-2020; Accepted: 18-06-2020; Published: 04-07-2020
www.sportsjournal.in
Volume 5; Issue 4; 2020; Page No. 11-13

To find out the effect of recovery posture on VO_2max using Queens College step test in young females of 18-25 years

Pinky Raghani[1*], Manasi Sanghavi[2], Ajay Kumar[3]
[1] Associate Professor, DPO Nett College of Physiotherap, Thane, Maharashtra, India
[2] Clinical Therapist, Thane, Maharashtra, India
[3] Principal, DPO Nett College of Physiotherapy, Thane, Maharashtra, India

Abstract
Background: Maximum oxygen consumption is considered as "gold standard" of cardio pulmonary fitness. Queens College step test is an indirect measurement of VO_2max. It is one of the simplest test to estimate physical performance of an individual.
Aim: To find out effect of recovery posture on VO_2 max using Queens College step test in young females of 18-25 years.
Objective: 1. To calculate VO_2 max using standing as a recovery posture in Queens College step test.
2. To calculate VO_2 max using sitting as a recovery posture in Queens College step test.
Methodology: Females of age group 18-25 years according to the selection criteria were selected for the study. Each subject's basic parameters BP, RR, HR and Borg scale are taken at rest before performing Queens College step test and at the completion of the test the vitals i.e. BP, RR, HR and Borg Scale are again taken in recovery posture i.e. standing and sitting. Afterwards VO_2 Max is calculated for each posture.
Result: Mean VO_2 max at standing position was 45.91ml/kg/min which were same to mean VO_2 max at sitting position i.e. 45.84ml/kg/min and the difference was not statistically significant. Which proves that any position adopted after completion of test (recovery position) doesn't alter the hemodynamic parameters which further doesn't have any effect on calculated VO_{2max} values.
Conclusion: There is no significant difference in VO_2 max values calculated using standing and sitting as recovery posture in Queens College step test.

Keywords: VO_2 max, queens college step test, recovery posture, BP, HR, RR

Introduction

Fitness is the general term used to describe the ability to perform physical work [1].

Ways to asses fitness of the patient

1. Heart rate recovery
2. Rate of Perceived Exertion (RPE)
3. VO_2 max

1. **Heart Rate Recovery:** Heart rate is total number of heart beats per minute. Person's heart rate is a key concept in testing physical fitness and how quickly it returns to normal after excessive exercise. Hence heart rate can also be good indicator of cardio respiratory endurance [2].
2. **Rate of Perceived Exertion:** Perceived exertion is how intense a person believes his or her body is working and hence perceived exertion is subjective [2]. Borg's Rating of perceived exertion (RPE) is based on subjective feeling of exertion and fatigue during exercise and it is used to asses and regulates exercise intensity [3].
3. **VO_2 max:** Maximum oxygen consumption is a measure of the body's capacity to use oxygen. It is usually measured when performing an exercise that uses many large muscle groups. It is maximum amount of oxygen consumed per minute when the individual has reached the maximum effort. It is usually expressed relative to body weight as milliliters of oxygen per kilogram of body weight per minute (ml/kg per minute). It is dependent on the transport of oxygen, the oxygen binding capacity of blood, cardiac function, oxygen extraction capabilities and muscular oxidative potential [4, 5, 6, 7]. Maximum oxygen consumption is considered as "gold standard" of cardio pulmonary and muscle cell fitness. Those who are more fit have higher VO_2 max can exercise longer than those who are not well conditioned. Cardio respiratory fitness can be assessed in athletes, sports person and also cardiac patients using VO_2 max as assessment parameter [8].

Two methods of VO_2 assessments

- **Direct:** VO_2 max is measured directly by Douglas bag or by Benedict Rosh apparatus.
- **Indirect:** VO_2 max is measured indirectly by submaximal and maximal tests.

Sub maximal Maximal

a. 6 mins walk test a. Shuttle test
b. 3 mins walk test - run and walk test
c. Queens college step test b. Cyclic ergometry
d. Haward step test c. treadmill.

The direct measurement of VO_2 max is currently the only reliable quantitative method for cardio vascular fitness evaluation. However, measurement requires costly equipment and exhaustive performance which is hardly practical in population fitness test where mass measurements is require. Alternative is indirect

measurement. The maximal test requires maximal exertion by the patient to estimate the VO_2 max which the patient may not be able to fulfill. So, sub maximal exercise is utilize instead of maximal exercise which also can be used to estimate VO_2 max [6].

Queens College step test

It is one of the simplest and an inexpensive test used to estimate the physical performance of an individual. The objective of Queens College step test is to monitor the development of the athletes cardiovascular system [9]. The Queens College step test is one of many variations of step test procedures, used to determine aerobic fitness [10]. According to the study done by Amit Bandyopadhyay which says that Indian females often fail to complete Harward step test because of premature fatigue in their lower limbs though they do not reach their cardiorespiratory exhaustion level. This is due to high stool height and faster cadence of haward step test [11]. Compared to Haward's step test, this version has a lower step height, slower cadence, shorter test and more simpler analysis [10].

Reliability and Validity

Satipati Chatterjee (2005) Validity of Queens College Step Test for estimation of maximum oxygen uptake in female students stated that VO_2max value exhibited significant negative correlation (r = -0.83, P<0.001) with QCT pulse rate. For precise and reliable estimation of VO_2max in the studied population a new equation was computed.

S Chatterjee *et al*. (2004) 'Validity of Queens College step test for use with young Indian men' this study showed that Queens College Step Test exhibited significant statistical correlation (r = 0.95, p<0.001) between directly measured VO_2 max and VO_2 max obtained from the Queens step test prediction equation. The results suggest that QCT can be applied in the studied population to produce a good estimation of maximum oxygen uptake, especially in the field where large numbers of participants are to be evaluated without a well-equipped laboratory.

Material and Methodology

Type of Study: Comparison Cross-Over
Location: Metropolitan City
Duration: 2 months
Sample Selection: Females between 18-25 years of age
Sample Size: Total 40 females
Sampling Method: Convenience sampling
Inclusion Criteria:

- 18-25-year-old females
- Females who are willing to participate in the study.

Exclusion Criteria

- Cardiovascular/respiratory/musculoskeletal/neurological problem
- Fracture.
- Deformities.
- On any regular exercise programme.

Material

Metronome, Stop Watch, Sphygmomanometer, Stethoscope, Stool Used for QCT

Procedure

40 females according to the above-mentioned selection criteria were selected for the study. Prior to the study, a written informed consent was taken of each subject in the language best understood by them. Each subject's anthropometric measurements (height and weight) were taken prior to the test. Basic parameters BP, RR, HR and Borg scale are taken at rest. Subjects are also instructed about the correct use of Borg scale and the whole procedure is explained to the subject warm-up is given to every subject before starting with the test. Queens college step test is performed on a stool of height 16.5 inches or 41.3 cms for the total duration of 3 minutes at rate of 22 cycles per min which is set by metronome. Subjects are to step using a four-step cadence "up-up down-down" for 3 mins. The subject stops immediately after the completion of the test and the vitals like BP, RR, HR (5-20 secs), and RPE are taken immediately and at sixth minute to know the recovery period in standing posture. Again, the same procedure was done on same subject after 2 days but this time the vitals after the test are taken in sitting posture. Afterwards VO_2 max was calculated using the formula further for both the postures.

Formula for VO_2max in QCST (females)

VO_2 (max) =65.81-[0.1847*heart rate (bpm)].

Findings

Demographica Data

Table 1

No. of cases	40
Age (Yrs)	19.88
Mean SD	1.32
Range	18-23 yrs

In this study group age of the subjects were ranging from 18 - 23years with mean age being 19.88 years.

Table 2

Posture	Mean VO_2 max ($\overline{X}$ ± SD)
Standing (N = 40)	45.91 + 04.71
Sitting (N = 40)	45.84 + 02.88

By student t test t = 0.0801, DF=78, P = 0.9362 Not Significant

Above table states that mean VO_2 max at standing position was 45.91ml/kg/min which were same to mean VO_2 max at sitting position i.e. 45.84ml/kg/min and the difference was not statistically significant.

Discussion

Table 1 shows VO_{2max} calculated in standing and sitting position. The difference in VO_{2max} values is 0.07ml/kg/min which is statistically insignificant.

Table 2 showing comparison of hemodynamic parameters (heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate, rate of perceived exertion) in sitting and standing position is statistically insignificant.

Which proves that any position adopted after completion of test (recovery position) doesn't alter the hemodynamic parameters which further doesn't have any effect on calculated VO_{2max} values.

Conclusion

There is no significant difference in VO_2 max values calculated using standing and sitting as recovery posture in Queens College step test.

Clinical Implication

In clinical practice in order to check patient's endurance when Queens College step test is performed the rest and recovery parameters should be taken in patient's comfortable position i.e. standing or sitting. The position does not alter the outcome measure of the Queens College step test.

Acknowledgement

I take this wonderful opportunity to thank all the "HANDS" which have joined together to make this project a SUCCESS.

It's my great pleasure and privilege to express my deep felt gratitude to our respected Principal sir Dr. Ajay Kumar and Guide-Dr. Priyanka Narkhede who immensely helped me and rendered their advice, precious time, constant encouragement, knowledge and relevant information regarding my study, and whose suggestions and guidance has enlightened me on this subject.

It's my great pleasure to thank all my subjects who participated in this study, without them this study would not have been possible.

I also take this opportunity to thank the Statistician, Librarian, all the teaching and non-teaching staff, my friends and colleagues for their support.

Conflict of Interest: no conflict

Source of Funding: Self

Ethical Clearance: Approval is taken from the ethical committee of the institute.

References

1. Therapeutic exercise by Carolyn Kisner and Lynn Allen Colby: Principles of aerobic exercise 5thed, pg 232.
2. American college of sports medicine: Guidelines for exercise testing and prescription 6ded Philadelphia: - Lippincott Williams & Wikings, 2000.
3. Borg G. Perceived exertion as an indicator of somatic stress. Scandiavian Journal of rehabilitation Medicine, 1970; 2:92-98.
4. American College of sports medicine: ACSM's Guidelines for Exercise Testing and Prescription. ed 7. Lippincott Williams, Wilkins, Philadelphia, 2005.
5. McArdle WD, Katch FI, Katch VL. Essentials of Exercise Physiology, ed3. Lippincott Williams, Wilkins, Philadelphia, 2005.
6. McArdle WD, Katch FI, Katch VL. Exercise Physiology: Energy, Nutrition, and human performance, ed.5. Lippincott Williams, Wilkins, Philadelphia, 2001.
7. Powers SK, Howley ET. Exercise Phisiology: Theory and Application,ed 4.McG raw-Hill, Boston, 2001.
8. Shepard RJ, Allan C, Benade Ajs et. The maximum oxygen intake.An International reference standard of cardio respiratory fitness. Bull World Health Org, 1968; 38:757-764.
9. Mc Ardle rd al, 1972.
10. WD Mc Ardle, *et al*. Reliability And inter relationships between maximal oxygen uptake, physical work capacity and step test scores in college women medicine and science in sports, 1972; 4:182-186.
11. International journal of sport and health science, 2008; 6:15-20.
12. J Exerc sci Fit, 2007, 5(2).
13. Indian J Med Res 121, January, 2005, pg 32-35.
14. J Sports Med Phys Fitness. 1992; 32(3):282-7.
15. Annals of Biological Reseach. 2011; 12(6):p371.
16. Priyanka Honkalas, Satish Pimpale, Mayuri Ghumatkar, Samina Hussain, Ajay Kumar. Assessment of peak expiratory flow rate in spray painter, International Journal of Recent Scientific Research Research. 2017; 8(6):17410-17413.