www.jmscr.igmpublication.org
Impact Factor 3.79
Index Copernicus Value: 5.88
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: http://dx.doi.org/10.18535/jmscr/v4i02.18

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

The Comparative Study of Anaerobic Peak Power Output in Trained and Untrained Subjects

(Research Article)

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ABSTRACT

Aim: *To evaluate the peak power output in trained and untrained subjects*

Methods and materials: *This study was conducted by selecting 40 healthy male students in the age group of 21-23 years. Average height is 163 cm +2 and average weight is 63 kg +2. First group included 20 students who do jogging 30 minutes four days a week for the past 10 months and second group included 20 students who do not do any exercise daily. Subjects attended physiology department RIMS, ONGOLE around 3 PM. All the 40 students were asked to warm up for 3-5 minutes by peddling the bicycle ergo meter. Warm up increases the flow of blood to working muscles. Prevents heart damage during first few seconds of heavy exercise otherwise there will be inadequate blood flow to the heart.[8] Then they were asked to take rest for 5 minutes. Then the subject begins peddling the bicycle as fast as possible for 30 seconds. After 3 seconds of peddling predetermined resistance was applied to the flywheel. An electrical counter continuously records flywheel revolutions in 5 seconds intervals. The highest output is observed during the first 5 seconds. Anaerobic peak power output = Force x Distance[1] (Time).*

Results: *P value of PP is 0.001.*

Conclusion: *Anaerobic peak power output is high in trained subjects than in untrained subjects.*

Key words: *Peak power output (PP), Bicycle ergo meter (Martin), Wingate anaerobic 30 cycle test (WANT), watts (W)*

INTRODUCTION

In the recent years physical exercise has gained prime importance in public life for its enormous health benefits. Cardiovascular and metabolic disorders have become common in individuals leading a sedentary life. Body fitness and weight control greatly reduces CVS disease. This results from maintenance of moderately low blood

pressure, reduced blood cholesterol and low density lipoprotein along with increased high density lipoprotein.[9] The entry of glucose into skeletal muscle is increased during exercise in the absence of insuin. This increase in glucose entry persists for several hours after exercise and regular exercise training can produce prolonged increases in insulin sensitivity.[11] Exercise improves the physical fitness in otherwise normal individuals. As the response of the body to an acute exercise stress depends on the individual's ability to sustain such stress, which reflects the level of his physical strength, various exercise stress tests are carried out for determining the individual fitness level.

We have chosen Wingate anaerobic 30 cycle test (WANT) to determine peak anaerobic power output in trained and untrained subjects [5]. By this method we can also determine anaerobic fatigue and total anaerobic capacity[4]. This WANT was developed during the 1970s at the Wingate institute in Israel. This test is easily available, simple to setup and conduct and also minimal equipment is required.

Anaerobic peak power output plays a big role in sprinters, weight lifters, jumping, football, dashes etc. Peak power output can be increased in normal individuals also by regular exercises[2]. Peak power output uses phosphocreatinine system for its energy because the ATP in muscle is only about 5 m mol/L of intra cellular fluid and this amount can maintain maximum muscle contraction for not more than two seconds[6]. The amount of phosphocreatinine in the cells is three to eight times this amount and the maximum contraction can be maintained for 5 to 10 seconds [7].

MATERIALS

Bicycle Ergo meter (Martin) is with a bicycle frame supported by a wooden stand, from the front of which two uprights ascend and carry a desk and cross piece, which provide for the attachment directly in front of the subject of the tension balance and other piece of apparatus. It also consists of a cast iron wheel measuring 158 cm or 1.58 m. in circumference, weighing 22 kg and mounted on ball bearing is substituted for the back wheel. It is having spring balance which can adjust the resistance. One more important part of this bicycle ergo meter is the electrical counter which can record the number of revolutions of the wheel per specific time.

The present study was carried in the department of physiology RIMS Ongole Andhra Pradesh. 40 healthy volunteers were selected between the age group of 21-23 years. Height is 163cm $\pm$ 2 and average weight is 63kg +2. Height and weight were measured without shoes and with minimal clothes to the nearest 0.5cm and 0.1kg respectively before the test was conducted. One group included 20 subjects who were selected from local gym and doing jogging for 30 minutes duration four days a week since 10 months. Second group included students of RIMS medical college Ongole during no specific exercise.

Alcoholics, smokers and any other with cardiovascular or respiratory problems are excluded for the test.

METHODS

The subjects attended the physiology laboratory at 3 PM. They were explained about the procedure. Height and weight was recorded. All the 40 subjects were asked to warm up by peddling the bicycle for 3-5 minutes. They were asked to take rest for 5 minutes.

Then command go is given and started the stop watch and the subjects pedals as fast as possible with fly wheel resistance after 3 seconds, predetermined fly wheel resistance is applied and subjects continues to pedal as fast as possible until 30 seconds has elapsed. After 30 seconds subjects stop peddling fly wheel resistance is equivalent to 0.075 kg per kg body mass of the subject. For 65 kg weight person the fly wheel resistance is equal to 4.875 kg (0.075 x 65). Peak power is ideally measured in first 5 second interval of the Wingate test and is expressed as follows.

Peak Power Output = Force x Distance[1] (Time in seconds)

Force is the amount of resistance (kg) added to the flywheel. Total distance is the number of revolutions x the distance per revolution. Time is 5 seconds. The result for peak power is expressed in watts (W)

Statistics: Obtained data was analyzed statistically by student's t- test.

The p value less than 0.005 are considered significant.

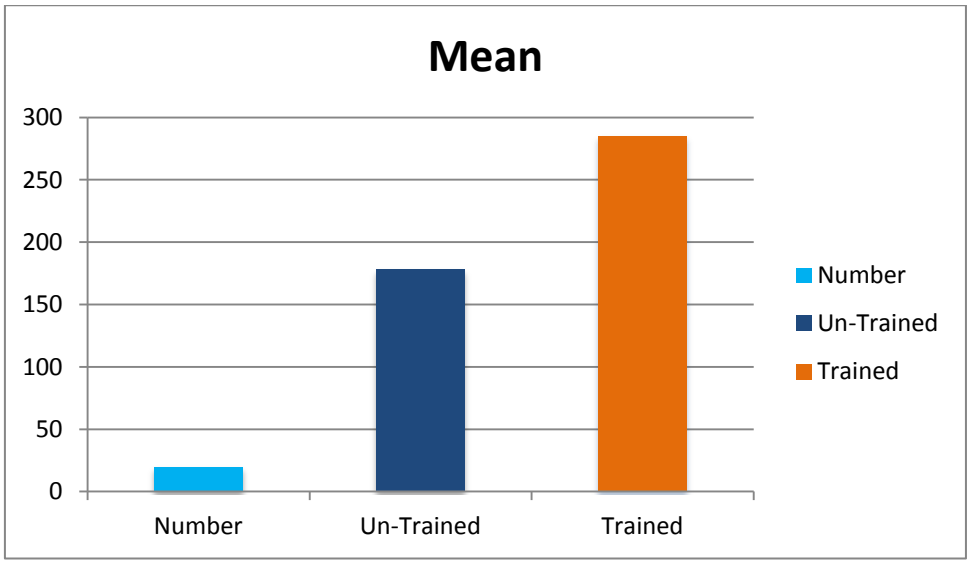
RESULTS

The ' p' value is 0.001 which is highly significant.

Table – 1 The mean values of anaerobic Peak Power Output in un-trained and trained Subjects

Variables	Number	Un-Trained	Trained
Mean	20	178.1446	285.0155
Std. Deviation	20	43.20836	68.40984
Std. Error mean	20	9.66168	15.29691

Graph–1 The mean values of anaerobic Peak Power Output in un-trained and trained Subjects



DISCUSSION & CONCLUSION

Regular muscular exercise increases the muscle mass due to hypertrophy of the muscle fibres. There is increased amount of contractile proteins such as actin and myosin.

Fast twitch fibres generate a great amount of power in a short period of time such as during a sprint. In other works the fast twitch fibres give a person the ability to rapidly and forcefully contract their muscles. Fast twitch fibres are able to generate more power because they are twice as large in diameter as slow twitch fibres and the enzymes that release energy form the phosphogen and glycogen lactic acid energies are two to three folds active in the fast twitch fibres.

So increased muscle mass increases the stores of phosphocreatinine levels, so that there is increased anaerobic peak power output in trained subjects [1].

Finally regular training is essential not only for maintaining physical fitness of sports persons but also of army men and police persons. Both of rest and at any given level of exercise, trained athletes have a larger stroke volume and lower heart rate than untrained individuals and they tend to have large hearts.[10] In general population also regular exercise improves the physical health as well as psychological healthy [3].

REFERENCES

1. W.D. McArdle, F.I. Katch, V.L Katch, Exercise Physiology 5th edition; Lippincott Williams and Wilkins; Energy, nutrition and human performance. Page Number 228 and 245.
2. Withers R.T, Roberts R.G.D, Davies GJ. The maximum aerobic power, anaerobic power and body composition of south Australian male representatives in athletics, basketball, field hockey and soccer. Journal of Sports Medicine 1977; 17; 391-400.
3. S Chatterjee, P Chatterjee, P.S Mukherjee, A. Banddyopadhyay British journal of Sports Medicine 2004; 38; 289-291.
4. Pathak. C.L, "Muscular work and fatigue-a review," IJPP, 1969 : 13 (2): 87-97
5. INBAR.O-et-al (1996) The Wingate anaerobic test champion, Illinois, Human kinetics.
6. Scott K. Power, Edward T. Howley Exercise Physiology 3rd edition. McGraw-Hill Page Number 243.
7. Scott K. Power, Edward T. Howley Exercise Physiology 3rd edition. McGraw-Hill page number 382.
8. Text book of Physiology AK JAIN Vol. – I Sixth Edition Page Number. 482.
9. Guyton & Hall Text book of Medical Physiology 10th Edition Page Number. 977.
10. Review of Medical Physiology William F. Ganong. Twenty First Edition Page Number 637.
11. Review of Medical Physiology William F. Ganong. Twenty First Edition Page Number 355.