Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2015; 3(8A):2760-2763 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2015.v03i08.005

Research Article

Comparison of Maximum Voluntary Contarction Using Hand Grip Dynamometer in Sedentary and Physically Active Young Adults

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Abstract: Skeletal muscle function can be affected by many factors including nutrition, hereditary and physical activity. Physical activity can be defined as any body movement by the skeletal muscles that require energy expenditure. A sedentary life is a type of lifestyle with irregular physical activity or no physical activity. The main aim is to compare the skeletal muscle function in sedentary and physically active young adults by using Hand grip dynamometer. The method in this study was conducted among 50 sedentary and 50 physically active healthy medical and paramedical students in the Physiology department, Sri Ramachandra Medical College & Research Institute, Chennai. Both male and female were included in this study and their age group was between 17 to 28. In conclusion our results showed that skeletal muscle function like maximum voluntary contraction were higher in physically active young adults than sedentary young adults. So we conclude that regular physical activity has definite impact on skeletal muscle function parameters.
Keywords: Muscle function, Physical activity, Young adults

INTRODUCTION

Muscle is a connective tissue and it has the property of contraction. Muscle is important for locomotion and movement of the body. Skeletal muscle function can be affected by many factors like nutrition, hereditary and physical activity. Physical activity can be defined as any body movement by the skeletal muscles that require energy expenditure. Doing physical activity is called exercise and it should be planned, structured, repetitive, and purposeful one which improves and maintain physical fitness of the body. A sedentary life is a type of lifestyle with irregular physical activity or no physical activity[1]. Sedentary activities which includes doing job in sitting posture, watching television , playing video games and doing work in the computer for long time daily with little or no vigorous physical exercise. This sedentary lifestyle later could lead a way for many diseases [2]. Physical activity is a important determinant of energy expenditure and this is fundamental to energy balance and weight control. It reduces the risk of coronary heart disease, stroke, hypertension, type II diabetes and breast cancer among women [3]. It also improves mental and psychological health by reducing depression, anxiety and stress, control over using substances like tobacco, alcohol, drugs, unhealthy diet like junk foods and violence particularly in children and youth. Those who are doing regular physical activity and healthy lifestyles during childhood and adolescence would produce definitely a healthy life during old age. Prospective research studies have shown clearly that regular physical activity protects against heart disease. Sedentary peoples are approximately twice as likely to suffer a fatal attack as their more physically active counterparts [4]. Today adults in the modern world lead sedentary life mostly and they are more prone for non-communicable diseases like diabetes mellitus, hypertension, obesity etc. So this study was planned with an aim to evaluate the muscle function in sedentary and physically active young adults

MATERIAL AND METHODS

This cross-sectional study was conducted in the Physiology Department, Sri Ramachandra Medical College and Research Institute, Chennai among 50 sedentary and 50 physically active healthy medical and paramedical students. Both male and female were included in this study. Their age group was between17 to 28. Histories of any cardiac and respiratory illness were excluded from the study. Physical activity questionnaire, anthropometric measurements, clinical examination and muscle function test were administrated to all the study subjects. Approval was given by the institutional ethics committee, Sri Ramachandra University, Chennai to conduct this study. Protocol

of the study and the benefits of the study was explained to the subjects and written consent was obtained before the study. Muscle function parameter namely Maximum voluntary contraction was measured using hand grip dynamometer (Inco). This dynamometer has a dial, two pointers (one fixed, and one moveable) and a handle. The dial has graduations from 0 to 60kgs and it is subdivided in the units of 5. The handle is used to hold the instrument firmly while performing the tests. One pointer stays in zero and the other moves and reaches the maximum unit reflecting the skeletal muscle power of the individual. While performing the test one pointer stays back in zero and the other one moves and the graduation is the value of muscle function. First the subject was allowed to study the instrument for a short time; and then asked the subject to hold the dynamometer in right hand so as to have a full grip of it; then instructed to close his eyes and to compress the handles with maximum effort. The tension developed was measured and waited for one minute. The whole procedure was repeated and best reading was taken. It is measured in kgs.

Statistical Analysis:

The data was expressed in mean ± SD. Comparisons between groups for all the measured variables were made using independent 't' test. Data was analysed using SPSS (Statistical Package for social sciences) version 19. A 5% level of probability was used to indicate statistical significance. Data expressed as mean ±SD. Statistical significance (<0.05)

RESULTS:

Maximal voluntary contraction was significantly higher in physically active males when compared to the sedentary males.

Table 1: Comparison of Maximal voluntary contraction (kgs) (Hand grip dynamometer) between sedentary and physically active groups' .physically active male and female subjects recorded by Hand grip dynamometer. The maximum voluntary contraction was significantly higher in physically active male subjects than sedentary subjects

S.No	Parameter		Sedentary (Mean ±SD)	Physically Active (Mean ±SD)	P Value
	Maximal Voluntary Contraction (kgs) **(Hand grip dynamometer)**	Male	2050 ± 994	3227 ± 1500	0.000
		Female	2480 ± 784	2178 ± 1190	0.49

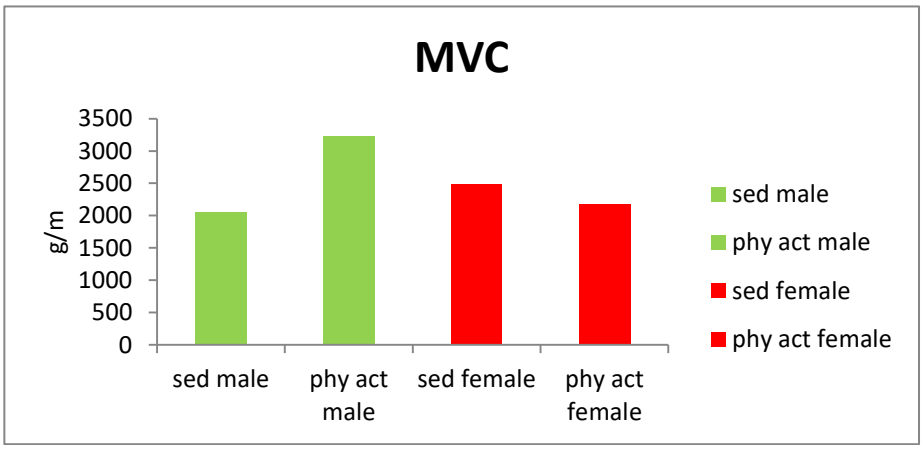

Fig-1: Comparison of maximum voluntary contraction (MVC) in sedentary and physically active male and female subjects

DISCUSSION

We conducted a cross sectional study in our Institution to assess skeletal muscle function in 50 sedentary and 50 physically active young adults of both sexes and the results showed higher muscle function in physically active groups. Upper extremity strength was assessed by Hand grip dynamometer. Beneficial effects of doing regular physical activity in the human body are the one which increases local blood flow to the working muscle and diverting the blood flow from non-vital organs to vital organs. Physical activity increases the rate and depth of breathing so that in working muscle there is increase in the delivery of oxygen from hemoglobin. These mechanisms can increase the blood flow and amount of oxygen available to the working muscle by almost 15 times. So the primary objective of

this study was to evaluate the skeletal muscle function in sedentary and physically young adults by using HGD.

Maximum Voluntary Contraction had done by Hand Grip Dynamometer:

In our study, we have found that Maximal voluntary contraction was significantly higher in physically active males when compared to the sedentary males (Table 1). MVC was higher in physically active male subjects than female subjects [5, 6, 7]. This could be explained on the basis of increased muscle power, endurance and increased capacity to perform greater in physically active males when compared to females [8, 9]. This may also be due to hypertrophy of the different muscle fibers. MVC was higher in sedentary female subjects than physically active female subjects. This could be explained on the basis of more tolerance and individual power capacity of the females. In physically active individuals, increase in the number of actin and myosin filaments called hyperplasia and also increase in the size of the individual muscle fibers. This causes the muscle hypertrophy. When hypertrophy develops that could leads to progressive greater number of both actin and myosin filaments in the myofibrils. Along with increasing size of myofibrils, the enzyme systems which provide energy also increase. This is especially true of the enzymes required for glycolysis which allows rapid supply of energy during short-term forceful muscle contraction [10] Apart from this, cellular changes in mitochondria of trained skeletal muscle have a greatly increased capacity to generate ATP aerobically by oxidative phosphorylation. Associated with increased capacity of mitochondrial oxygen uptake is an increase in both the size and number of mitochondria and a potential twofold increase in the level of aerobic system enzymes. These changes may be important in sustaining a high percentage of aerobic capacity during prolonged exercise. There is an increase in the trained muscle capacity to mobilize and oxidize fat. This occurs by an increase in blood flow within muscle and in the activity of fat mobilizing and fat metabolizing enzymes. At any submaximal work rate, a trained person uses more free fatty acids for energy than an untrained counterpart. This is beneficial to endurance athletes because it conserves the carbohydrate stores so important in prolonged exercise. During physical inactivity, muscle remains unused for many weeks and decay of contractile proteins is at more rapid rate than the rate of replacement. Therefore muscle atrophy occurs. This could be the reason for lower MVC in sedentary groups. Hand grip strength (HGS) is a measure of strength of several muscles in the hand and the forearm has gained attention more among all muscle function tests because it is a simple one and non-invasive test to determine upper extremities muscle strength which is well suitable for clinical use [11].The power of hand grip is due to the forceful flexion of all fingers joints with the maximum voluntary force that the subject is able to exert under bio-kinetic conditions [12]. It has a positive correlation with physical activity. It has been used as a prognostic tool in follows up of patients with neuromuscular disease. Patients with impaired grip strength could be an indicator of decreased physical status, increased postoperative complications, length of hospitalization and higher rehospitalisation rate.

CONCLUSION

From our study we conclude that skeletal muscle function like maximum voluntary contraction was higher in physically active males than sedentary males. This showed that regular physical activity has definite impact on skeletal muscle function parameters. So measures to be taken among sedentary young adults to improve their muscle functions by motivation, encouragement to do physical activity which would help them to lead a quality life.

Lacunae of This Study:

In this study, sample size was smaller, this is one of limitation. Studies with larger sample size study would have helped us to find out the skeletal muscle function in sedentary and physically active young adults in a better manner.

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