Introduction to Exercise Physiology & Sports Performance

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Lecture – 39

Role of exercise in disease prevention

Good morning, ladies and gentlemen and welcome to lecture 4 of week 8 of this course on exercise physiology and sports training. I am Colonel Dr. Anup Krishnan and I will be your instructor for this lecture where we will be discussing the role of exercise in disease prevention.

I will be covering this topic under the following headings. Introduction, we will talk about some activities, we will define the various types of exercise and discuss them, we will discuss about the benefits of exercise, we will talk about the role of exercise in disease prevention and we will conclude with a take home message.

There are several chronic diseases which are non-infectious, slowly progressing, prolonged and usually caused by genetics, environmental factors and poor lifestyle. There has been a rise in their incidence due to sedentary lifestyle coupled with excessive caloric intake. Physical inactivity has been found to be a modifiable risk factor. There are several risk factors for these chronic diseases and they are classified as modifiable and non-modifiable. Things such as genetics are non-modifiable risk factors but physical inactivity is a modifiable risk factor that means you can modify it by your actions. What are the actions which you will take? You will take physical activity and you will do exercise and these can help to prevent these chronic diseases.

Physical inactivity was earlier considered a secondary risk factor for the development of coronary heart disease. However, it has been now confirmed to be a primary risk factor for coronary heart disease similar to smoking, hypertension and high serum cholesterol. Regular vigorous physical activity is instrumental in reducing the risk of coronary heart disease even in smokers and hypertensive patients. I repeat regular vigorous physical activity can reduce the risk of coronary heart disease even in smokers and hypertensives.

The American Heart Association has recognized physical inactivity as a primary or a major risk factor in heart disease. Epidemiological studies show that increase in physical activity is associated with a reduced death rate from all causes as well as from coronary heart disease. It shows that physical activity should be used along with other therapies to reduce the risk of coronary heart disease in those possessing other risk factors also.

There are some differences when we talk about physical activity, physical fitness, exercise. There are some differences which we should know. Physical activity is defined as any form of muscular activity. Physical fitness is defined as a set of attributes that people have or develop. Exercise represents a subset of physical activity that is planned with a goal of improving or maintaining fitness. If I go for a walk in the morning and I plan to do it complete 5 kilometers or 6 kilometers within 45 minutes and I plan to maintain a heart rate at 60 or 75% of my maximum achievable heart rate, this is exercise. If during my work day I walk from one

building to another, I go from one building to another, I go for my ward rounds, I go for my laboratory rounds from this building to the other building, this is physical activity. And if my VO2 max improves, my endurance improves, my lower limb strength improves, as a result of exercise or as a result of this physical activity, that is physical fitness. So, I hope the differences between physical activity, physical fitness and exercise is clear.

Exercise can be classified into three types. Anaerobic, Anaerobic and Flexibility.

Aerobic or endurance exercise causes the body to use more oxygen, thereby improving cardiovascular endurance. Examples are running, swimming, brisk walking, skipping rope, dancing, etcetera. Anaerobic strength or resistance training can increase body mass and improve bone density and balance. Examples are push ups, pull ups, squats, weight lifting and sprinting. Flexibility exercises involve stretching of muscles to improve flexibility and movements around the joints.

The benefits. An exercise program will improve VO2 max and a higher VO2 max is associated with a lower death rate. Physical activity including that done at moderate intensity results in substantial health benefits. The reduction in the risks of coronary heart disease may be mediated through changes in the distribution of cholesterol and increase in fibrinolysis that is the clot dissolving activity or a reduction in systemic low-grade inflammation.

Regular exercise prevents conditions like diabetes, cardiovascular diseases and obesity. Physical activity plays a beneficial role in the health of both the young and the old. Regular physical activity is associated with improved cellular functions and tissue processes. Highly significant decreased susceptibility to type 2 diabetes mellitus, cardiovascular disease, cancer and decrease in the risk of early death due to chronic illness or aging is also one of the benefits of exercise.

Prior to the publication of the 2008 US physical activity guidelines, there was a review which was done and it found that the volume of the physical activity done was the most important variable tied to health outcomes. That means if you do more physical activity, you get better health outcomes. The risk of many chronic diseases was reduced by 20 to 40% by regular physical activity with the greatest gains made by those moving from no activity to doing some activity. Some physical activity is better than none and there is no lower threshold for benefits. Individuals are encouraged to be active even if they cannot meet the minimum intensity of duration recommendation. A dose response relationship existed for most health outcomes meaning that more is better.

Physical activity and health. Regular participation in physical activity was associated with lower rates of all-cause mortality, total cardiovascular disease and coronary heart disease incidence and mortality. All these were found to be low. Increased weight loss and reduced amount of weight regain after the weight loss. A lower incidence of obesity, type 2 diabetes and metabolic syndrome and a lower risk of colon and breast cancer.

Regular participation in physical activity was associated with an improvement in the ability of older adults to do activities of daily living. Reduced risk of falls in older adults at the risk of falling. Reduction in depression and cognitive decline in older adults. Favorable changes in cardiovascular risk factors including blood pressure and blood rapid profile.

When you talk about physical activity as a risk factor, we can see that lower levels of physical activity predated the onset of coronary heart disease. As physical activity increased, the risk of coronary heart disease decreased. Physical activity improves glucose tolerance, increases fibrinolysis and reduces blood pressure. Sedentary person have twice the risk of experiencing coronary heart disease than physically active people. The relative risk was similar to smoking, high serum cholesterol and high blood pressure. As they say now, sitting is the new smoking. Physical inactivity is proven as an independent risk factor for coronary heart disease. In 1992, the American Heart Association added physical inactivity to its list of primary or major risk factors for cardiovascular disease.

Let us talk about exercise and obesity. Lack of physical activities and exercise increase the risk of morbidity in inactive obese patients. Lack of physical activity increases body weight, risk of obesity and causes reduced insulin sensitivity. There is a relationship between the intensity and amount of exercise and the level of weight loss in total body fat and visceral adipose tissue. High intensity interval training is an effective and therapeutic exercise for combating obesity. A minimal dose of exercise is needed to reduce body fat with higher volumes of training giving better results.

Exercise and diabetes. Inactivity groups showed over 26% increased susceptibility to type 2 diabetes than high activity groups. Although obesity is a risk factor for type 2 diabetes, increased physical activity can reduce the risk. Obese individuals with higher levels of physical activity had less than half the relative risk of type 2 diabetes compared to obese individuals who had low levels of physical activity. It means that if you are fat and active, your risk is low. Exercise decrease the amount of body fat in obese children and teenagers thereby decreasing their chances of developing diabetes.

Exercise and cancer. Regular sustained physical activity protects against several types of cancer. Physical activity has been shown to cause a 20% decreased susceptibility to colon cancer. Regular aerobic exercise and physical activity seems to be more effective than the intensity of the exercise. Most studies show a protective effort with a 13% decreased risk in high versus low physical activity groups.

Exercise and cardiovascular disease. Exercise has the ability to decrease susceptibility to cardiovascular disease like coronary artery disease and atherosclerosis. High levels of activity are associated with low BP, high levels of HDL, low levels of LDL, increased insulin sensitivity and glucose tolerance. Individuals who were moderately inactive had a substantially lower CVD risk than those who were completely inactive.

Exercise and respiratory diseases. People with respiratory diseases should be encouraged to exercise. Physical activities and exercise should be encouraged at the early diagnosis of COPD and being able to maintain a level of physical activity is associated with a better prognosis. Daily physical activity has protective effects and walking in patients with asthma can improve the quality of life and help to control asthma.

Physical activity and mental health. Physical activity and exercise has been found to increase the levels of neurotransmitters like serotonin and endorphin thereby reducing depression. People who exercise frequently are not often depressed and do not suffer anxiety. Exercise enhances cognitive functions in adolescents and aged adults and also prevents cognitive deterioration associated with aging. Exercise decreases the risk of having dementia, prevents deterioration of mental abilities and enhances the quality of life.

Let's talk about the take home message. Physical inactivity is the primary cause of many chronic diseases. Exercise and physical activity has been shown to be effective in the treatment of chronic diseases and helps in the primary prevention of chronic diseases. Inclusion of exercise and physical activity in one's daily routine will reduce the risk of chronic diseases and its associated mortality. Exercise and physical activity provides a healthy and cost effective alternative to other treatment methods for chronic diseases and especially for primary disease prevention.

These are the references which we have used in preparing this lecture. Ladies and gentlemen, I strongly urge you to go through them in the interest of better and vast understanding of the topics which have been covered. I thank you for your time, ladies and gentlemen and we will be glad to answer any queries or comments. Kindly send them to the email which is flashing on the screen and thank you, ladies and gentlemen. Thank you and Jai Hind.