

Introduction to Exercise Physiology & Sports Performance

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Lecture – 40

Role of exercise in Disease management

Good morning, ladies and gentlemen and welcome back to the course on exercise physiology and sports training. This is lecture 5 of week 8, and we will be discussing the role of disease in exercise management. We have discussed the role of disease in exercise prevention. Now we will talk about exercise management.

We will talk about the guidelines for exercise prescription. We will talk about the screening before any exercise. We will talk about the exercise prescription. We will talk about the exercise session. We will talk about how to progress an exercise session. We will talk about the differences in exercise prescription in some diseases. And as usual, we will conclude with a take-home message.

The American College of Sports Medicine and the Surgeon General of the US state the need for a moderate intensity exercise throughout life. General population should do low-risk physical activity to achieve some health-related benefits by reducing the cardiovascular and metabolic diseases. However, there is a need to follow a variety of guidelines in prescribing moderate to strenuous exercise that is aimed at improving VO₂ max. Yes, ladies and gentlemen, exercise is a drug and yes, ladies and gentlemen, exercise is to be prescribed by a certified exercise physician.

The United States Physical Activity Guidelines state that individuals can realize substantial health-related benefits of physical activity by doing 150 to 300 minutes of moderate intensity physical activity per week or 75 to 150 minutes of vigorous intensity physical activity per week or some combination of the two. 150 minutes of moderate intensity physical activity or 75 minutes of vigorous intensity physical activity is the minimum goal.

The range of physical activity that is 150 to 300 minutes indicates that more health-related benefits are realized by doing additional activity. That means more is better. Resistance training at least one set or 8 to 12 reps of 8 to 10 exercises on 2 or more days per week is required to improve or maintain muscular strength and endurance. An increase in moderate intensity physical activity is an important goal for reducing health-related problems in sedentary individuals. The overall risk of cardiac arrest in vigorously active men is only 40% of the risk in sedentary men. There are so many reports nowadays of men dying due to cardiac arrest during exercise but it must be stressed upon that the overall risk in vigorously active men is only 40% of the risk in sedentary men. That means sedentary men are at more risk of cardiac arrest.

The relative risk of death from all causes decreases as cardiorespiratory fitness or VO₂ max increases. This relationship is also true when applied to the risk of chronic diseases. For each

one met increase in cardiorespiratory fitness, the risk of death from all causes decreases by 13%. Before you start any exercise program, screening is a mandatory requirement. Health status screening is mandatory prior to starting an exercise program. The risk of cardiovascular complications during exercise is directly related to the degree of pre-existing cardiac disease. That means if you had some cardiac disease before starting exercise, your risk of cardiovascular complication during exercise is higher. Risk of sudden death in young women and men is due primarily due to congenital or acquired heart disease which can be picked up by screening.

Now let us talk about something called the exercise prescription. There is something called the FITT-VP principle which allows all of the major elements of an exercise intervention to be individually prescribed with dosage. Let us take it one by one. FITT-VP principle. F for frequency, basically means how often is an activity done expressed in terms of days per week or in terms of number of times per day. Intensity, how hard is the activity and it is described in terms of percentage of VO₂ max, percentage of maximal heart rate or rate of perceived exertion and it may also be described by the lactate threshold.

Time. The duration of the activity expressed as the number of minutes of activity. Type the mode or the kind of activity which is done whether the exercise is a resistance or a cardiovascular type of exercise. Volume. Volume of exercise is the product of frequency, intensity and time and is directly related to health benefits.

Volume= Frequency x Intensity x Time

Progression. It describes how to transition an individual from easier to harder exercise during a training program.

From an exercise prescription to the exercise session, what do you do when you come for an exercise session? Initially you do warm up and stretch that is prior to the actual exercise session, you do a variety of very light exercises and stretches which are done to improve the transition from the rest to the exercise state. The emphasis is to gradually increase the level of activity until the proper intensity is reached.

After you finish the exercise session, you do something called a cooling down and a stretch. Stretching exercises increase the range of motion of the joints involved in the activity as well as there are specific stretches to increase the flexibility of the lower back which should be included in the warm up. At the end of the activity session, about 5 minutes of cooling down activities should be done to gradually return the heart rate and blood pressure towards normal.

Walking. It is the primary activity for sedentary persons. It gets people to be active by providing an activity that can be done anytime, anywhere and with anyone. Walking when combined with long duration is an effective part of weight control and cardiovascular disease risk factor reduction program. Walking is an activity that many people find they can do every day and it provides many opportunities to expend calories.

Jogging. Jogging begins when a person moves at a speed and form that results in a period of flight between foot strikes. Net energy cost of jogging or running is about twice that of walking at slow to moderate speeds with a greater cardiovascular response. That means if you walk and then you jog or you run, the cost of energy expended is double with jogging or running as compared to walking. However, there is more stress on joints and muscles due to the impact forces during jogging or running.

The emphasis is to make the transition from the walking program with minimal discomfort and this can be accomplished by a jog-walk-jog program. Jogging and running is to be avoided in obese patients, in patients with ankle, knee or hip issues. Alternatives for these individuals are cycling and swimming.

The exercise session should also include games and sports. Games are activities that require higher levels of energy expenditure but in a more intermittent fashion. Games and forms of group exercise can maintain a person's interest in a physically active lifestyle. But it should be built on a walking and jogging base. Participants should have some skill and be reasonably well matched while undertaking games and sports.

Strength and Flexibility training. The American College of Sports Medicine and the Public Health Physical Activity Guidelines recommend both strength and flexibility exercise as part of the complete fitness program. Resistance training has a variety of health benefits in addition to increasing or maintaining strength. And the American College of Sports Medicine recommendation emphasizes dynamic exercises to be done on a routine basis.

Flexibility is the ability to move a joint through its normal range of motion. And the American College of Sports Medicine recommendations for static stretching include stretching to the point of mild discomfort and holding for 10 to 30 seconds. Please note, without hold periods, stretching is of no value. Doing each stretch 2 to 4 times, that means 2 to 4 times repeated. Doing stretching exercises at least more than 2 days per week.

The United States Physical Activity Guidelines is to use progression when introducing someone to physical activity or helping an individual move from moderate intensity to vigorous intensity activity. Progression is to be used in a gradual manner. And this approach is to be used across populations from children to older adults.

Recommendations for progression include using the relative intensity to guide the level of effort. And transitioning from light to moderate to vigorous intensity activity and not the reverse, that means walk before you jog or run. Start with a light or moderate intensity activity and gradually increase the number of minutes per days or days per weeks before you increase the intensity.

Recommendation for progression include, the increase should be approximately 10% per week. That means 10 minutes or more for somebody who is doing 100 minutes per week. The rate of increase should be lower for older people, for those who are less fit and those who are unaccustomed to exercise.

Let's talk about the exercise prescription in certain diseases. If you look at this chart, it shows exercise prescription in chronic heart failure. We are talking about the exercise prescription for aerobic activity because chronic heart failure requires improvement in the aerobic activity. So, if you look at the frequency, it says 4 to 7 days per week, preferably every day. That is the frequency. The intensity is you start at 40% of VO_2 or at 12 to 14 on the RPE scale. That means it's a low intensity and you gradually improve it up to 70%. Mode. You have to use activities that engage large muscle groups such as walking and cycling. Duration. Start with 20 minutes per day and gradually go up to 60 minutes. And please note, it may be a continuous activity or it may be an accumulated activity. You can do this activity in small pulses of at least 10 to 12 minutes throughout the day if you cannot continuously do 60 minutes per day. That is what this recommendation shows.

From CHF, let's come to COPD. If you look at the aerobic recommendations for COPD, look at the frequency. It's only 3 to 5 days per week. The earlier recommendations for CHF was 5 to 7 days per week. The intensity starts lower at 30 to 80%. The mode is walking or cycling. Swimming is generally avoided in people with COPD. And the duration is 20 to 60 minutes per session. There are, what I mean to say is there are subtle differences in exercise prescription in different diseases. And everything has to be modulated and changed as per the symptoms, as per the individual's physical condition, as per the disease itself. That is why it says intensity and duration of exercise should be individualized to reflect the severity of symptoms.

Let's talk about the take home message which we have from this lecture. Physical inactivity is a primary risk factor for coronary heart disease. Regular participation in physical activity can reduce the overall risk even in smokers and hypertensives. People with increased physical activity and or cardiorespiratory fitness show a lower death rate from all causes as compared to the sedentary people. An exercise dose reflects the interaction of the intensity, frequency, and duration to yield the appropriate volume of exercise. The response to an exercise intervention can be both functional changes and can be improvement in health outcomes. And these may be independent of each other.

Adults should aim for between 150 to 300 minutes of moderate intensity physical activity per week or 75 to 150 minutes of vigorous intensity physical activity per week. Resistance training of 8 to 10 exercises of 8 to 12 repetitions should be done on two or more non-consecutive days per week. This non-consecutive is basically the rest given for muscles to recover. In previously sedentary subjects, small changes in physical activity results in a large number of health benefits with only minimal risk.

Strenuous exercise reduces the overall risk of heart attacks. Moderate-to-high levels of cardiorespiratory fitness has health benefits and increases fitness for recreational activities. A sedentary person needs to go through a health status screening before participation in exercise. Exercise programs for previously sedentary persons should start with moderate-intensity activity and focus on increasing frequency and duration first before the increase in the intensity.

Target heart rate ranges between 60 to 80 percent or 70 to 85 percent of maximal heart rate is a reasonable estimate for the proper exercise intensity. Progression of physical activity from walking to jogging to games addresses the issues of intensity and injury risk. For many people, walking may be their only aerobic activity. Strength and flexibility activities should be included as a regular part of the exercise program.

These are the references which I have used for making this presentation, ladies and gentlemen. I strongly urge you to go through them. Thank you, for your time and your patience, ladies and gentlemen. We will be glad to answer any queries or comments. You can send them to the email which is flashing on the screen. Thank you, ladies and gentlemen. Thank you and Jai Hind.