LECTURE 3

# Exercise Adaptations & Recommendations

By **Cathal Fanning**

- **Organisations to Consult**
- **Chief Medical Officer (CMO)**
- **Different Age Ranges and Conditions**
- **Further CMO Considerations**
  **- long & short term benefits**

# Exercise Adaptations & Recommendations

Welcome to this lecture on the profound effects exercise has on the body, the adaptations we can make to enhance a well-structured plan, and the recommendations that surround exercise prescription.

We'll begin by discussing some of the sources and resources available to you when designing programmes, and some of the guidelines that exist around exercise prescription. We also hope to provide you with some research skills you can put into practice in your new career…

Let's get straight into some research methods that will help guide your exercise prescription.


## How to research unfamiliar medical conditions

Always stick to trusted sources when researching, particularly if it is something you are unsure of. You should network with sports therapists, GPs, physiotherapists and other PTs in order that you can seek sound advice from those better placed than yourself.

## Evidence-based health benefits of activity

It is important that we seek evidence-based guidelines and research when planning and delivering exercise to our clients. It can be far too easy to implement advice based on unsubstantiated claims - or believe and act upon sensational fitness headlines.

## Organisations and websites

Some of the places you might seek solid evidence-based research are as follows:

- British Heart Foundation.
- Change 4 Life.
- Chief Medical Officer.
- Department of Health.
- NHS.
- Diabetes UK.
- World Health Organisation (WHO).
- UK Active.
- American College of Sports Medicine (ACSM).

# Chief Medical Officer (CMO)

Below we discuss many of the guidelines laid out by the CMO. It is important to understand the recommendations in order that you can educate your clients as to the many benefits of a healthy lifestyle, and the potential risks of a sedentary one.

**It is widely agreed that moderate activity for 30-minutes most days is the volume of exercise necessary to make meaningful health progressions. The CMO has more detailed outlines that can be used and manipulated to suit your clients.**

## Youth Exercise Benefits

## 1-5 Years

**Benefits:**

Activity can lead to better social skills and enhanced relationships, better weight management in youth and into adulthood, improved sleep, musculoskeletal development, motor skills improvements and cognitive development.

**Recommendations:**

180 minutes per day of activity. This can range from 'tummy time' for under-1s, through to playing, climbing, dancing, s kipping, games, swimming, bike-riding etc for older kids. The general recommendation is to become more active in a variety of pursuits and to break up periods of inactivity with movement.

## 5-18 Years

**Benefits:**

Exercise can enhance motor skills, concentrating and learning, musculoskeletal integrity, weight management, confidence, social skills, general fitness and health. It increases self-esteem and self-efficacy and makes you feel good.

**Recommendations:**

At least 60 minutes per day on average across the week. Activities should be those that make you breathless and may include swimming, skating, structured workouts, dance, PE lessons, cycling to school, running/walking, playing, structured sports etc. The key again is to decrease the time you are inactive.

## 19-64 Years

Adults should aim for at least two sessions of muscle strengthening activity per week. Should attain at least 150 minutes (2 1/2 hours) of moderate intensity activity per week. Examples are brisk walking or cycling…OR accumulate 75 minutes of vigorous intensity activity such as running.

Aim to develop or maintain strength in the major muscle groups through resistance- based training. Guidelines state that the inclusion of heavy gardening, carrying heavy shopping bags, or resistance exercise is useful in achieving this.

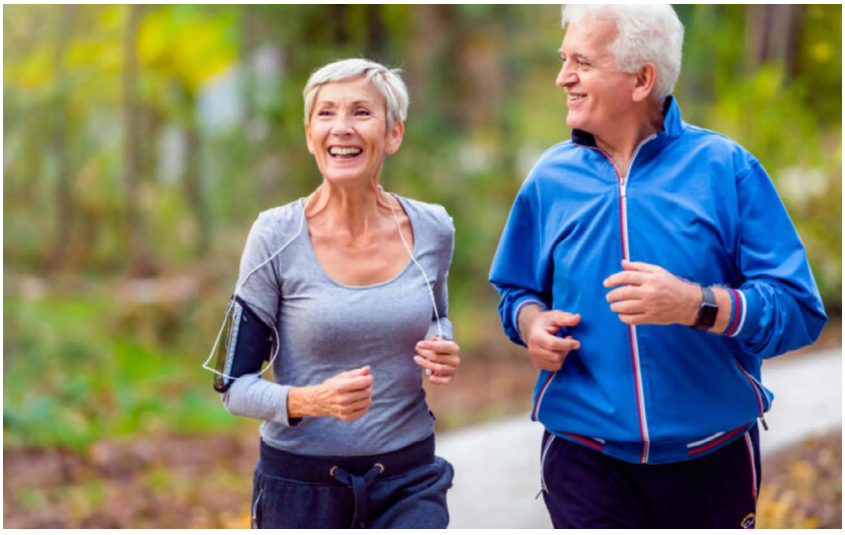
Guidance states that adults should aim to minimise the amount of time spent being sedentary if possible and try to be at least moderately active through the day. Break up periods of inactivity with moderate activity if possible.

Adults may choose to achieve a combination of moderate, vigorous and very vigorous intensity activity per week. This will have the greatest impact on a range of the body's systems and structures.

## 65+ Years

Should maintain or improve physical function by performing activities to improve or maintaining muscle strength, balance and flexibility at least two days a week. These may be combined with moderate aerobic activity or could be additional sessions.

Aim to accumulate 150 minutes of moderate intensity aerobic activity, building up gradually from current levels. Those who already exercise regularly may choose to do 75 minutes of vigorous intensity activity, or a combination of the two approaches. Weight-bearing activities will assist in maintenance of bone health.



Older adults should participate in daily physical activity to support their health benefits – these may include physical maintenance of all bodily systems and mental health, wellbeing, and social functioning.

Older adults should avoid long periods of being sedentary and try to achieve light activity when possible. Moderate activity throughout the day to break up periods of inactivity is beneficial

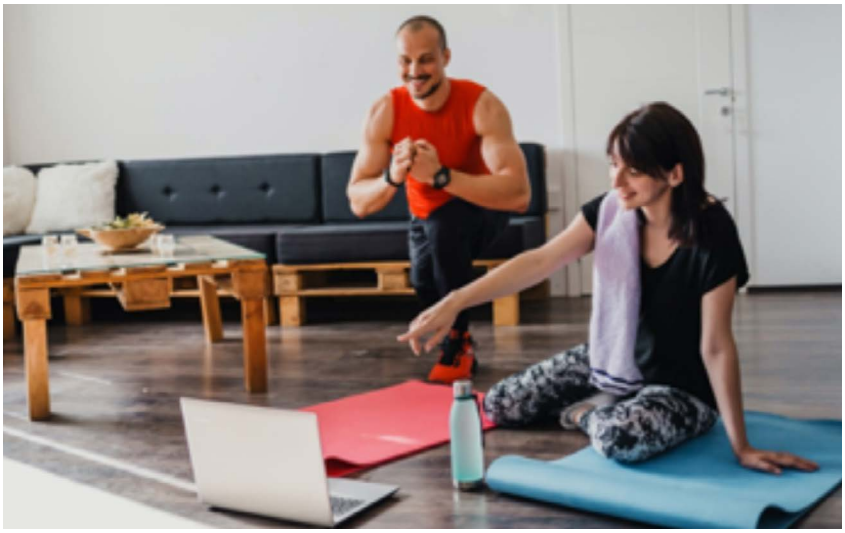
## Pre & Post Natal + Disabled

**Pre-Natal**

Hormonal changes and postural adaptations are two of the primary concerns with training pre-natal clients. You should start gradually, especially if you are currently a non-exerciser. Aim to achieve 150 minutes of moderate-intensity activity each week. This can be at home, outside or as part of a structured exercise programme. Listen to your body at all times and rest when you feel you need to. Try to achieve two sessions of resistance training per week within the guidelines. Avoid any type of abdominal trauma.

**Post-Natal**

Post-birth there are still hormonal adaptations, postural issues and traumatic internal issues that need to be respected with your clients. Focus on pelvic-floor exercises as soon as you feel ready. You should return to exercise gradually, working up to 150 minutes of moderate activity across the week. Aim to achieve two sessions of resistance-based exercise per week and listen to your body throughout the process, resting when you need to.



**Disabled**

The term ‘disability’ is one that covers an enormous range of issues and may be any condition of the mind or body, including neural disorders, progressive disorders, physical, asymmetrical issues, sensory, cognitive and mental health issues. Disabilities are issues that makes it more difficult for the person to carry out certain activities, day-to-day functioning or interactions. The CMO guidelines are to aim to achieve 150 minutes of moderate intensity activity each week, to include strength and balance exercise on at least two days, to engage in a range of activities and focus on those you enjoy, and to avoid being inactive for too long.

One thing to always bear in mind with pre/post-natal clients and disabled clients is that you must respect the boundaries of your qualification and always act with the best interests of the client in mind. If you are not suited to train a specific client, either through qualification, experience or your own level of comfort and confidence you should seek to assist in finding a suitable alternative for the client to train with.

# Further CMO Considerations

## Importance of Resistance Training

Guidance suggests that at least twice a week, all adults should take part in activities which increase or maintain muscle strength. The activities should challenge all major muscle groups in the upper and lower body and may include activities such as using bodyweight, free weights, resistance machines or bands, as well as activities of daily living such as stair climbing, carrying shopping, lifting and carrying children, and gardening. The important thing is that the exercise is challenging in order that it offers some potential for progression over time.

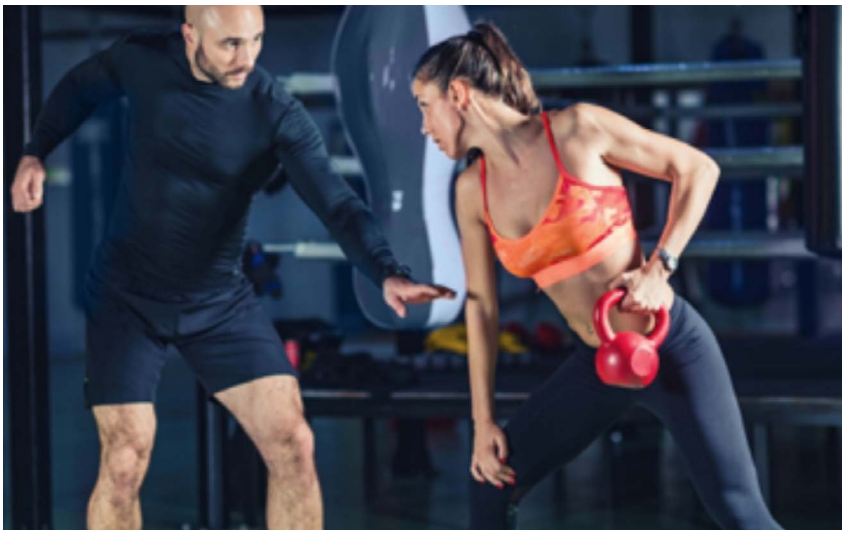
## Dose-Response

There exists a relationship with exercise activity and health benefits, and the CMO indicates that this is largely linear. The recommended guidelines are outlined in this module for various age-groups but it is understood that even if you don't achieve these minimum recommendations that there are still benefits to be gained.

There are also additional health improvements to be achieved when exceeding the targets suggested by the CMO also. There will likely be an absolute limit as we understand the higher the frequency, the lower the intensity that may be possible, but the message is that the more active we can be in the day, week, month etc the better it will be for us.

Each of the guidelines we have discussed from the CMO can be split loosely into two different categories – **resistance** and **cardiovascular**. From there we can focus on each category in terms of two different types of adaptations – short-term and long-term. Let us first give a little more detail to these areas of training.

## Resistance Training



Resistance training would encompass any exercise modality that places the musculoskeletal system under stresses that it is unaccustomed to on a day-to-day basis. This may be weight-training, swimming, carrying items, manual labour and gardening.

## Cardiovascular Training

CV exercise and can be characterised by activity that raises the heart rate above resting levels for a period of time. The duration and intensity can be manipulated to target the Aerobic and Anaerobic systems respectively.

## Short Term Adaptation

During exercise we experience the short-term effects. An example of this would the an increased breathing rate, heart rate and sweat response as a result of a bout of cardiovascular exercise.

## Long Term Benefits

While using cardiovascular exercise as our example, we would expect to see a decreased resting heart rate as a result of increased stroke volume in the long term, following several sessions.

Exercise obviously has a great effect on our health, and wide-ranging effects on the body. Depending on how we train, we will see different results.

## We will now establish how each of the systems of the body will respond in the short and long term to different exercise modalities…

## Short Term Cardiovascular Effects

Cardiovascular exercise will initiate a response in the central nervous system (CNS) to increase heart rate, breathing rate and vasodilation in response to incremental-intensity CV exercise. The harder the exercise the more sympathetic-system activity will take place to accelerate the adaptations. We need to ensure that we are delivering more oxygen to the working tissues so these mechanisms are initiated to achieve this goal. A sweat response will also be initiated in order to help cool body temperature.

## Long Term Cardiovascular Effects

In the lungs we will see an increased tidal volume and vital capacity as well as improved efficiency of gaseous exchange in the alveoli. As with the muscle tissues we would likely see an increased capillarisation around the alveoli.  An improvement in the function and strength of the breathing muscles should also enhance the benefits.

We would also expect to see improved circulation through the network of blood vessels as well as increased efficiency. There should be an increase in mitochondria number and size leading to improved gaseous exchange. An increased blood volume and red cell count will lead to better carbon dioxide delivery.

In the heart we can experience ventricular hypertrophy, which is an increase in the size and strength of the cardiac muscle which means that it can expel a greater volume of blood per beat. This will lead to a reduced resting heart rate.

## What About Resistance Training?

Cardiovascular exercise will have the most significant impact on the cardiovascular system of course. However, there may also be some benefits to the CV system from resistance training. There are many exercise modalities that blend CV and resistance methodologies into a high intensity interval training ( HIIT) - style session for instance, and we may see some incidental heart-rate response to higher-rep exercise and strength training.

## Short Term Effects on The Skeletal System

In the short-term we will experience an increase in synovial fluid production as a result of movement. Synovial fluid is secreted during exercise to nourish and protect the joints and to provide pain-free frictionless movement.

This will begin during a warmup and highlights the reason to always make sure a comprehensive warmup is performed. We may also experience an increase in the range of movement available dependent upon the type of exercises included in the session.

## Long Term Effects on The Skeletal System

Through consistent training we should achieve stronger structures over time – including connective tissues. We are also likely to see increased bone density and mass based on stresses placed upon the skeletal system, leading to reduced sarcopenia and osteopenia risk. This will be especially important in ageing adults.

It is generally acknowledged that these benefits will be enhanced when people undertake some form of impact and resistance training, although the impact in CV exercise can also be very beneficial in this regard. Generally speaking, we should make sure that all our clients have some resistance exercise in their programmes, relative to their ability, to ensure strong skeletal structures.

## Benefits of Resistance Training

**Muscular Size**

There are two understood mechanisms that we know lead to muscular hypertrophy.

- The first one is known as sarcoplasmic hypertrophy and is associated with typical hypertrophy-based workouts featuring moderate weights, moderate sets and moderate reps. This results in more fluid being held in the muscle tissues.

- Sarcomere hypertrophy is the other mechanism and is linked to strength training. This is a form of hypertrophy that results in more actin and myosin filaments being formed and situated in the muscle, hence the greater muscular size and subsequent strength.

**Neural Adaptations**

The nervous system will become more efficient at recruiting the muscles it needs for a given task. This means the recruitment will become faster and potentially better synchronised. This all may lead to strength improvements. In effect your nervous system becomes more adept at using your muscles.

**Hormonal Response**

It's important to view exercise as a stimulus. This stressor demands increased activity from the body to repair and recover. Resistance stimulus demands that the body learns to better deal with future efforts. Based on this you may secrete more testosterone and growth hormone as a result of training, which will give the body the environment it needs to repair and recover.

## Flexibility Training

Flexibility training will enhance a great many aspects of fitness also. A greater functional range of movement (ROM) will mean you can achieve a better movement capacity with exercise, increasing your results. It will also assist in alleviating muscle stiffness, may help to prevent injury, could assist in managing symptoms of lower back pain and should enhance day-to-day activity.

## Let's now look at some of the overall benefits that can be seen with consistent and regular exercise, the various modes of exercise available to you.

### Running

Whether indoor on a treadmill or curved treadmill or outdoors, running is an excellent load-bearing form of CV training.

### Swimming

Swimming has a unique benefit in that it is a resistance exercise, and a CV exercise. Of course, with the variety of different swimming strokes available you can effectively work a whole host of muscles and your cardiovascular system at once.

### Low Impact CV

Where running will offer a form of impact there are several options of cardiovascular exercise that don't, such as rowing and indoor cycling sessions.

### Classes

There are a wide range of classes available from choreographed, music-based sessions and structured resistance-based classes through to more holistic classes such as yoga.

### Free Weights

Barbells and dumbbells - portable weights that offer great freedom in movement capability. Free weights demand better balance and coordination as well as offering the added benefit of training the stabiliser muscles.

In addition almost all free-weight exercise will train the core musculature.

## Bodyweight

Bodyweight training offers benefit in terms of being able to exercise at home and it also offers a high level of self-mastery. It is a good feeling to be able to lift your bodyweight.

The restriction is being able to effectively train for a variety of goals as the load/resistance is harder to vary to achieve the required overload.

## Small Equipment

Slam balls, vitality/ performance/reconditioning (ViPRs), medicine balls, kettlebells and suspension training kits are some of the alternative options you have when training clients. The benefits are that they are portable and don't require a lot of space.

## Resistance Machines

Machines offer a fixed path, meaning they are a great way to train the primary target muscles without the stabilisers fatiguing. Can also be good for beginners who may not yet have the required stability and coordination to use free weights.

## Isometric Work

Isometric exercise is work against a fixed resistance, or a stationary position such as a plank or a wall-sit.

These exercises can be great for working on muscular endurance but shouldn't be used with hypertensive clients as there is a risk of elevating blood pressure due to their being no pause in the intensity.

## Resistance Bands

Bands offer a unique style of resistance - they get heavier as they get more stretched, which usually coincides with you being at a stronger, more advantageous position. For example, if you're doing a bicep curl it will be loosest at the bottom position where you are mechanically weakest. You will feel more resistance at the top of the movement where you have a mechanical advantage.

**This module will hopefully have helped you in the quest to offer sound advice to your clients. It was designed to offer you a greater understanding of the benefits of exercise, the adaptations that take place when the programme is well planned, and also how you can source relevant, appropriate information.**