NHS Education for Scotland

NHS Training for
Physiotherapy Support Workers

## Workbook 9

# Supervision of active exercise

NHS SCOTLAND

# Contents

Workbook 9

# Supervision of active exercise

## 9.1 Aim

The aim of this workbook is to provide the Healthcare Support Worker (HCSW) with the knowledge, understanding and skills to safely and effectively carry out an active exercise programme.

## 9.2 Learning outcomes

**By the end of this workbook you will be able to:**

- Discuss and demonstrate the appropriate preparation of both patient and environment for exercise.
- Assess the patient's needs and identify any change in their condition before, during and after exercise.
- Demonstrate and teach exercises to patients accurately and with appropriate feedback and encouragement, progressing exercise as appropriate.
- Explain the principles used to prescribe and progress exercise.
- Demonstrate assessment of muscle strength using the Oxford Scale and relate the findings to the different types of muscle strengthening exercises.
- Identify when patients are progressing or regressing and respond to this within the scope of your practice.

In order that you gain the most from this workbook it is important you complete the following workbooks prior to this one.

- Workbook 4 Musculoskeletal System
- Workbook 12 The Cardiovascular system
- Workbook 14 The Respiratory System

## 9.3 Supervising exercises

Much of the work of the physiotherapist involves prescription of exercise to address physical impairments that affect the patient's ability to function and perform normal activities in everyday life.

As a physiotherapy support worker, much of your work will involve supervision of patients as they carry out these exercises. You will also have responsibility for reporting to the physiotherapist any changes in the patient's condition.

## 9.4 The environment

When planning an exercise session with patients, either for individual patients, or for a group of patients, it is important to ensure that the environment is suitable for the activity. The activities may take place in the ward, by the patient's bedside, in the gym, or in the patient's home.

**Factors that you might need to consider would be:**

- **Access**
  - Can the patient get to the area easily?
  - Do they require assistance or transportation?
- **Is there enough space for the activity?**
  - Consider what the patient will be doing.
  - Is there enough space?
  - Is there enough privacy to ensure patient dignity?
- **Is the lighting, heating or ventilation correct, according to relevant guidelines?**
  If you do not know what these are for your work area, ask your supervising therapist or manager to assist you to find out.
- **What equipment will you need for the exercise session?**
  You may need:
  - weights
  - theraband
  - sliding boards
  - sling suspension
  - pulleys
  - theraputty
  - wobble boards
  - steps or boxes
  - other equipment
- **Consider also what furniture you might need:**
  - Will the patient be exercising on a chair?
  - On the bed?
  - If not sitting to do the exercises, should there be a chair for the patient to sit in to rest?

- **Do you need any other resources?**
  - water or juice?
  - towels?
  - documentation, information leaflets or exercise sheets?

This should all be planned in advance of the exercise session to ensure that the exercises are safe for the patient, and effective.

### Risk assessment

Remember the health and safety risk assessment process, and carry it out before proceeding with the exercise session

- **Identify any hazards that may result in harm to you or the patients**
  - slipping
  - tripping
  - manual handling
  - Is supervision or assistance adequate?
- **Consider who might be harmed**
  - patients
  - yourself
  - other workers
- **Take correct steps to control the risks**
  - Make sure that the area is free of clutter.
  - Ensure that there is enough space.
  - Clear anything that the patients or you may trip on.
  - Ensure that there are enough staff to supervise.
- **Is there anything further that needs to be done to control or eliminate the risk?**
  - Do you need a formal risk assessment?
  - Does the manager need to be informed?
  - Are you satisfied that the area is safe for this exercise session?

## Evidence

Describe here how you prepared the environment for an exercise session with an individual patient, or with a group of patients. Include information about how you selected the location, how you ensured that the heating, lighting and ventilation were adequate, how you prepared the area for use, what risk assessment you carried out and how you controlled any risks.

| |
|---|
| Describe what you did |
| What went well? |
| What could have been better? |
| What would you do differently next time? |

## 9.5 Preparing the patient for supervised exercise

**Individual's needs and abilities**

To ensure that you enable the patient to be adequately prepared for their exercise session, you must be aware of the patient's individual needs and abilities, or those of a group of patients, where that is appropriate.

The therapist will already have assessed the patient and the results of the assessment and the plan for the exercise programme will be documented in the therapy records.

## Activity

With your supervising therapist, examine the therapy records of a patient with whom you will be supervising exercise sessions.

- What do you need to take into account for this patient when you are supervising their exercise session?
- Does the patient have any previous medical history or disability that requires consideration, or change to the planned programme?
- For example, does the patient suffer from asthma or bronchitis, which may make them more breathless than normal?
- Does the patient need assistance to position themselves adequately to perform the exercises?
- Does the patient have any particular cultural requirements? For example, are they able to undress suitably, or do they require to be treated only by female staff?
- Does the patient need any particular equipment, for example, a hoist, a chair of a particular height etc?
- Is the patient suitably dressed for the session?

## Evidence

Provide examples of any particular needs and abilities of your own patient and write them here with an explanation of how you are going to address those needs in order to enable them to complete the session.

### Checking if there has been any change in the physical condition of the patient

You need to ask the patient if there has been a change in his or her condition since the last session or assessment.

You need to then make the judgement as to whether any change should be reported to the therapist – if you are unsure, consult your supervising therapist.

There may be the need for the therapist to change the exercise programme, or to discontinue exercises, depending on the change in the condition of the patient.

## Evidence

Describe here an occasion on which the patient reported a change in condition prior to an exercise session.

| |
|---|
| What did you do and why? |
| What went well, and what could have been better? |
| Anything you would do differently next time? |

### Checking that the patient understands the structure and the purpose of the session

The patient needs to understand the structure of the exercise session. It is therefore very important that you:

- Remember to introduce yourself to the patient – who you are and why you have come to see the patient.
- Explain to the patient the structure of the session, and what you are going to do.
- Ensure that the patient understands the structure of the session.
- Clarify anything that the patient does not understand.
- All your communication with the patient should be done in a way that encourages understanding and co-operation.

### Explaining the purpose of the exercise session

You need to explain the purpose of the exercise session to the patient.

In order to do this, you need to know why these particular exercises have been prescribed by the therapist.

Are the exercises for:
- muscle strengthening
- muscle endurance
- range of movement, or flexibility
- cardiovascular fitness?

You must be able to explain the purpose clearly to the patient in language that they can understand – take care about the use of terminology – some technical terms, such as flexion, or extension will be hard for the patient to understand.

You must also explain to the patient what is expected of them in terms of the manner and pace of the exercises. Each patient has an individual pace that is comfortable for them.

The patient should be aware that they should work at the pace he is comfortable with and that they are not expected to do otherwise.

## Evidence

Using an example from your practice, describe here:

- How you ensured that the patient understood the structure of the session
- How you explained the purpose of the exercise programme and the manner in which it should be undertaken by the patient
- How you responded to any questions from the patient

| |
|---|
| Describe in detail what you did |
| What went well, and what could have been better? |
| Anything you would do differently next time? |

### Responding to questions from the individual

Ensure that you ask the patient if they have any questions before you start the exercises and ensure that you answer them clearly and concisely.

### Confirm the patient's consent to the programme

Having ensured that the patient understands what they will be doing with you in the exercise programme, you must ensure that they consent to taking part. You must document their consent in the records.

## Activity

Describe here how you would ensure that the patient was willing to participate in the exercise programme.

| |
|---|
| What difficulties might there be in ensuring that the patient consented? |
| How might you deal with the difficulties? |

## 9.6 Supervising the exercises

**What is important when supervising individuals who are undertaking therapeutic exercise?**

**Factors to consider:**

- Ensure that you are familiar with the exercise programmes that you are to provide to patients.
- You will be expected to supervise patients in carrying out their programme.
- You should be absolutely clear that you know exactly what is required and what is meant by the therapist's instruction. Do not proceed if you do not know what is required.

- Introduce yourself to the patient – this is courteous and good practice.
- Ensure that the patient is appropriately clothed. Maintain the patient's dignity, ensure that the patient feels comfortable with their clothing.
- Ensure that the patient is comfortable and in a position that is appropriate to the task.
- Use the correct equipment and carry out the exercises with the patient as prescribed and directed by the physiotherapist.
- Ensure that the exercises are correctly performed.
- Keep your instructions simple, don't use complicated terminology.
- Give a demonstration to ensure clarity.
- Demonstrate using passive movements if the patient is deaf or dumb/mute.
- Provide appropriate encouragement, correction and feedback.
- Make sure that the corrections are clear and accurate.
- Provide them at the appropriate time – during exercise or in the rest period.
- Ensure the correct number of repetitions is achieved with appropriate rest periods.
- Monitor the patient for signs of fatigue, discomfort or distress.
- **It is important to recognise signs of fatigue or pain. Patients may complain of discomfort and display a reduced capacity to continue exercising. At this point it is appropriate to stop and allow a rest period.**
- Discontinue if problems arise.
- When finished, remove any equipment and store carefully, leave the patient in a safe position with access to a call button.

- Report the patient's performance/progress to the physiotherapist and in particular any change in the patient's ability to perform the exercises, and the general condition of the patient.
- Record the exercise regime given in the patient's treatment record.

## Evidence

Describe what factors you think you should consider when demonstrating, teaching and supervising patients who are undertaking therapeutic exercise.

## Evidence

Describe here how you have demonstrated, taught and supervised individual patients or patients in a group, who are undertaking therapeutic exercise.

| |
|---|
| What went well? |
| What could have been better? |
| Anything you would do differently next time? |

We are going to examine in more depth what happens when an individual exercises, and the specific types of exercises that therapists can ask patients to perform.

## 9.7 Physiology of exercise

When we start to exercise, there is an increase in the amount of energy that is needed by the muscles. This results in an increase in waste products of metabolism, such as carbon dioxide and heat.

To enable us to:

- produce the necessary energy
- prevent build-up of waste products
- maintain body temperature

A number of physiological changes occur before, during and after exercise, most of which you will recognise, particularly if you have run for a bus or lifted a heavy weight!

**Pulmonary responses**
Remember that normally we breathe in oxygen, use it in metabolism and production of energy and that we exhale carbon dioxide, as a waste product.

Exercise increases the muscles' need for oxygen, and increases the amount of carbon dioxide produced. Exercise also produces waste products such as lactic acid.

To supply the muscles' demand for extra oxygen during exercise, the rate and depth of breathing are increased. The effect of this is to increase the amount of oxygen getting into the lungs, and the amount of carbon dioxide removed from the lungs.

This increases the amount of oxygen in the blood, which:

- takes oxygen to the muscles needing it during exercise
- increases the removal of carbon dioxide from the body

This increase in rate and depth of breathing may be seen before, during and after exercise, and will continue until the oxygen, carbon dioxide and temperature levels return to normal.

**Cardiovascular reponses**
The function of the heart is to pump blood round the body. The left side of the heart contracts to pump blood through the body in the arteries, providing the muscles and all of the body with oxygen. The blood gives up its oxygen at the tissues and collects the waste product, carbon dioxide. The blood is then returned to the right side of the heart, where it is taken to the lungs via the pulmonary artery. Here the blood passes round the lungs and is replenished with oxygen from the air that we breathe.

To supply the muscles with more oxygen during exercise, the cardiovascular system must increase the delivery of oxygen to the muscles. This facilitates:

- increased oxygen to the muscles
- removal of waste products
- regulation of temperature

The cardiovascular system adapts to exercise by:

- increasing the rate of the heart beat
- increasing the volume of blood pumped by the heart at each beat
- increasing the diameter of the blood vessels in the muscles, to provide the muscles with more blood and reducing the diameter of the blood vessels in the gut, where blood supply during exercise is not a priority.

Like the rate of breathing, the heart rate and volume of blood pumped will remain high after exercise, until the levels of carbon dioxide, oxygen and waste products of metabolism return to normal.

**Hormonal responses to exercise**

There are complex hormonal changes before during and after exercise. The exact nature of the changes depends on the type and duration of the exercise, and on the fitness of the individual.

The hormonal changes are associated with:

- increased supply of nutrients and oxygen to the muscle
- removal of metabolic waste products
- promoting the repair and growth of tissue after exercise, including the conditioning of muscle that occurs with regular exercise

Almost all the hormones in the body are affected by exercise, and their interactions are complicated. Some key hormones that are active are:

- **Adrenalin and noradrenalin** for stimulating pulmonary and cardiovascular responses.
- **Growth hormone** for repair of tissue and the release of fat as an energy source.
- **Testosterone** has a role in growth and repair of tissues.
- **Cortisol** has a role in production of glucose, for energy.
- **Erythropoetin** promotes the production of red blood cells, which enhance the oxygen-carrying capacity of the blood.

## Activity

When we exercise, there is an increase in the energy requirements of muscles.

A number of pulmonary, cardiovascular and hormonal changes occur to meet the increased energy needs. The changes increase the muscles' supply of oxygen and nutrients and assist in removal of waste products such as carbon dioxide, lactic acid and heat.

| Describe the pulmonary, cardiovascular and hormonal changes occurring during exercise, and explain why they occur. |
|---|
| Pulmonary changes |
| Cardiovascular changes |
| Hormonal changes |

## 9.8 Planning an exercise programme

**Principles of exercise prescription and progression**

The therapist will prescribe a safe and appropriate exercise programme for individual patients, which, as a support worker, you will assist the patient to undertake. The activities will depend on the goals of the individual patient, but will include principles of exercise prescription.

These are also used to progress the exercise programme, whether it is designed to increase muscular strength, increase flexibility or joint movement, or to increase aerobic or cardiovascular fitness.

The therapist will at the outset decide on the type of programme and will include a description in the patient's records of:

- **Frequency** How often the patient should perform the exercises.

– In the case of therapeutic exercises, this will normally be daily, sometimes 2 or 3 times per day. For cardiovascular or aerobic fitness, such as during cardiac rehabilitation, the therapist will probably recommend that the patient exercises at least 3 times per week.

- **Intensity** How hard the patient works

– For training of muscle strength, the intensity is about the resistance that the muscles are being asked to work at – for example, the weight being lifted.

– For aerobic fitness, the intensity is measured by the rate of the heart – the higher the rate the harder the patient is working. The therapist will prescribe the maximum heart rate for individual patients in the cardiac class, for example. Patients will monitor their own heart rate during exercise; sometimes they use a monitor for this.

– In some instances, such as cardiac and pulmonary rehabilitation exercise is described using the patient's perceived level of exertion (Borg Score.)

– Intensity will be increased to progress the exercises as the patient adapts and improves fitness or strength.

- **Time (Duration)** The time the patient spends exercising

– The duration of exercise can also be increased to progress the patient's training. Generally the therapist will specify how many repetitions of an exercise should be performed and will increase this as the patient accommodates to training. Often, exercises are performed in groups of repetitions, to enable the patient to work hard, but also to provide rest so that good performance is maintained.

- **Type** Which muscles to work and how to work them; what type of activities – cycling, running, recreational or functional activities

– Muscles can be exercised against gravity (concentrically) or into gravity (eccentrically). The changes in fitness or strength are specific to the activities being trained and the therapist needs to make a careful choice of activity to ensure that it best meets the goals of the patient.

## 9.9 Progressing exercise

As the patient improves, these principles can be used to progress the exercises to ensure that the patient continues to improve.

**Frequency**
Can be increased by asking the patient to exercise more often.

**Intensity**
Can be increased by asking the patient to lift a greater load with weights, or body resistance, or to increase the aerobic workload.

**Time**
The patient can be asked to exercise for longer.

**Type**
It may be appropriate to change the type of exercise being performed, to progress the exercise, from concentric to eccentric exercise.

**Precautions**

- Exercise should always be performed at a level that is comfortable for the patient.
- Progress should be gradual.
- Safety should be considered – risk assessment, warm-up and cool-down.
- Recognise when the patient is experiencing pain or discomfort and report immediately to the appropriate therapist.
- Recognise fatigue – when the patient is unable to fully perform the exercise, or when the muscles begin to shake.

## Activity

Find out how therapists in your unit use these principles when deciding on an exercise programme for patients.

Write here what you find.

## Evidence

Explain the principles of exercise prescription and progression.

Describe the precautions to be taken when prescribing or progressing exercise.

## 9.10 Theory: types of therapeutic exercise

### Warm-up

Warm-up refers to a preparatory phase at the start of an exercise session.

The purpose of warm-up is to:

- Prepare the body for the more strenuous exercise to follow, enabling the patient to cope more easily with the main activity
- Re-familiarise the patient with the content of the session
- Reduce risk of injury and premature fatigue, which can occur if the cardiovascular system is unprepared for strenuous activity

### Typical warm-up activities

These might include:

- **Gentle loosening exercises** Slow, controlled movements of the main joints: circling of the shoulder girdle, wrist, hip and ankle, flexing and extending the fingers and toes, gentle swinging of the arm and leg, heel raises. These are particularly important if the patient has been inactive for some time.
- **Gentle aerobic exercises** If this is appropriate to the therapeutic activity. Many therapeutic programmes do not include an aerobic component, so only do these exercises if they are appropriate to the programme that you are conducting with the patient. Examples of aerobic warm up would include walking round the room, cycling slowly on an exercise cycle.

These exercises increase the heart rate and increase blood flow to the exercising muscles, as well as increasing the temperature of the muscle in preparation for the more strenuous components of exercise.

- **Stretching exercises** This stage ensures that the muscles and joints are prepared for exercise. Examples of such exercises include moving joints through their full range of movement, and stretching the main muscle groups. Taking the arms above the head, behind the back, taking each hand as far down the back of the neck as possible, stretching the quadriceps muscle, pulling the foot up, stretching the hamstrings, are all examples of stretching exercises that can be used in warm up.

### Effects of warm-up

The physiological effects of warm-up are:

- To relax muscles and joints so that they can stretch further, maximising the effects of exercise and preventing tearing of cold muscle fibres.
- Aerobic exercise warm up prepares the heart , cardiovascular system and muscles for the activity.

- Warm-up causes the blood to go to the muscles, which require increased oxygen supply during exercise.
- Exercising without warm up means that the muscles may need to work without adequate oxygen supply. This leads to accumulation of lactic acid, which causes early fatigue and can be avoided with warm-up.
- Warm-up increases temperature, preparing the body for the strenuous exercise to come, be it aerobic or strengthening exercise.

**Cool-down**

Cool-down is a short period of exercise at the end of the exercise session when the activity of the body is returned almost to resting level. This stage includes:

- Low-intensity gentle aerobic exercise, where appropriate. This reduces metabolic waste products more than when exercise is suddenly stopped. This effect may occur because the muscles continue to receive more blood for longer, assisting in waste removal.
- The heart rate is gently returned to resting level, preventing adverse effects of exercise, such as fainting.
- Additional stretching exercises may be included at this stage, when muscles may be more receptive to stretch because the body is still warm.

## Evidence

Explain why warm-up and cool-down are important before and after any exercise session.

## Evidence

Describe how you ensured adequate warm-up and cool-down exercises before and after an exercise session with a patient in your care.

Describe why these particular exercises were selected for warm-up and cool-down.

| |
|---|
| What went well in a particular session with a patient or patients? |
| What could have been better? |
| Anything you would do differently next time? |

### 9.11 Exercises to increase muscle strength

Muscle strength refers to the maximal force (expressed in Newtons) that can be generated by a specific muscle or muscle group.

Many of the patients that you see will have weak muscles, because of illness or injury, with disuse, resulting from confinement to bed, or with immobilisation resulting from a cast following fracture, muscles reduce in size, losing strength.

Reduced muscular strength may result in reduced capacity to stand up, walk, climb stairs or lift objects, making everyday activities difficult or impossible. As part of the rehabilitation process, physiotherapists aim to develop bulk and strength in key muscle groups of patients with weakness in order to restore function.

Therapists assess the patient's muscle strength in a variety of ways and use the results to structure an exercise programme that is suitable to the patient and to their condition. The programme will be different, for example, for a patient who has had a knee replacement compared to a patient who is debilitated because they have spent time immobilised in intensive care.

## 9.12 How is muscle strength assessed?

### Muscle strength grading

To assess the existence of weakness, therapists may use a measurement scale called the Oxford MRC Scale for muscle strength grading.

When using this test, the patient is asked to perform the movement required, such as knee flexion or elbow extension with as much force as possible. The movement is resisted by the therapist using his or her hands, placed at 90° to the direction of the movement. The resistance provided by the patient is graded according to the scale below.

**Oxford MRC Scale for muscle strength grading**

| | |
|---|---|
| **0/5** | No contraction |
| **1/5** | Visible/palpable muscle contraction but no movement |
| **2/5** | Movement with gravity eliminated |
| **3/5** | Movement against gravity only |
| **4/5** | Movement against gravity with some resistance |
| **5/5** | Movement against gravity and full resistance |

## 9.13 Other methods of strength testing

### Maximal dynamic strength

Another method of strength testing used by therapists to assess strength is testing of maximal strength.

One method is to determine the 10 repetition maximum. Here the therapist assesses the maximum weight that the patient can lift 10 times before fatigue starts, characterised by muscle shaking. This weight is used to determine the most appropriate weight for training, in blocks of 10 repetitions of the exercise.

Sometimes, the patient is asked to try to lift the maximum weight possible. This is known as the 1 Repetition Maximum (1RM). When using this test, after a warm-up session, the therapist gradually increases the weight that the patient can lift. The 1RM is the heaviest weight that can be lifted, using good technique. From this, the therapist will then determine the most appropriate weight that the patient should use to strengthen their muscles.

If it is appropriate, the therapist may teach you how to assess muscle strength, for example, straight leg raise after arthroscopy or knee replacement on orthopaedics - following a pre-determined protocol only.

If appropriate, your therapist will demonstrate on you or on a model how to test and grade the strength of biceps, triceps, hamstrings and quadriceps.

Practice on a model, or on your supervising therapist. Discuss your performance and be sure that you are confident in positioning yourself and the model to adequately assess muscle strength. Decide on the appropriate grade. Discuss your choice of grade with your supervising therapist.

Under supervision, assess the same groups of muscles on an appropriate patient. Your supervisor will provide you with feedback.

## Evidence

Once you can perform the assessment accurately, find out how to test the strength of other muscle groups.

Describe here, using a patient example, how you assessed muscle strength.

| |
|---|
| What did you do? |
| What went well? |
| Anything that could have been better? |
| What would you do differently next time? |

## 9.14 Training muscles for strength

For a muscle to maintain its current strength it must be used normally. If not, it will lose its strength and may atrophy, or become wasted.

For a muscle to increase its strength it needs to be used more intensively than normal. Strength is the ability to work maximally at high intensity or resistance. This could be developed through use of weights, or by exercising against the resistance of the person's own body weight.

The principle of increased intensity of exercise to train any aspect of fitness is known as overload. In a strength-training programme, the intensity of exercise is progressively increased, to ensure that the muscle is overloaded. It is by working in this way that the muscle becomes stronger.

Exercises may also be performed to increase muscle endurance. Endurance is the ability to work for a long time against low resistance and therefore with many repetitions.

### Physiology

Skeletal muscles are composed of two types of fibre:

- **Red, or slow-twitch muscle fibres** These are small, but have good blood supply and are suited to endurance work – that is working for a long time with low resistance.
- **White or fast-twitch fibres** These have the capacity to work maximally for a short period of time and are therefore more biased towards strength work.

There are therefore different ways of training muscles through exercise, each of which will primarily develop either one or other type of muscle fibre and either strength or endurance.

### Exercises for different purposes

- **Training for maintenance** Sometimes the physiotherapist will decide that a patient requires only maintenance exercises, to preserve the strength, function or circulation that the patient already has and to prevent deterioration.
- **Training for strength** Exercise sessions to train strength capacity will use higher resistance or intensity and will comprise fewer repetitions. Although designed to address strength, this type of training will have positive effects on endurance and vice-versa.
- **Training for endurance** Exercises to train endurance capacity of muscles will use low resistance or intensity but will involve many repetitions. The purpose of this training is to enable muscles to work moderately hard over a long period of time. It may be important in many areas of rehabilitation and will often be combined with strength training.

## Evidence

Describe the different types of muscle strengthening exercises that therapists use with patients.

What is the principle of overload?

### How do therapists provide resistance for muscle strengthening?

There are various ways of providing resistance to strengthen muscles.

- **Body weight** Standing on one leg and bending and straightening your knee provides body weight resistance to strengthen the quadriceps muscle.
- **Auto-resisted exercise** This is when the patient uses the strength of another limb to provide resistance, for example when the other arm is used to resist shoulder flexion.
- **Quadriceps roll** Used to enable the patient to work the quadriceps muscle in inner range.
  The muscle needs to be strong in this range to be able to maintain stability of the joint.
- **Free weights and ankle weights** Sandbags, dumb-bells or weights of different sizes attached to the wrist or ankle by velcro may be used to increase muscle strength.
- **Springs** Springs attached to a frame can provide graded resistance to increase strength.
- **Theraband** Thick rubber band of varying stiffness that provides resistance to movement.
- **Stepping machine** Used to strengthen leg muscles.

### Eccentric and concentric phase of exercise

Some muscles may be trained while working to lift (**concentric action**), such as when bending the elbow with a weight in the hand using biceps. Biceps may also be trained while working to lower (**eccentric action**), such as when straightening the elbow when sitting or standing with a weight in the hand.

During the performance of these exercises, it is important that each phase is performed in a controlled manner.

### Starting positions for exercise

It is important that the patient is positioned properly for the exercises to be done. You should demonstrate the position required, and ensure that the patient is properly supported. This ensures that the patient can obtain maximum benefit from the activity.

## Evidence

Describe methods of muscle strengthening that you have used or been shown by your therapist.

| |
|---|
| How was the patient positioned? |
| How many repetitions of the exercise did the patient perform? |
| How did the therapist encourage the patient? |
| What were the indications that the patient had done enough? |

## Activity

**Provide examples of how each of the following can be used to strengthen upper and lower limb muscles. Name the muscles or muscle groups they are commonly used to strengthen.**

| |
|---|
| Body weight |
| Auto resisted exercise |
| Quadriceps roll |
| Free weights |
| Springs |
| Theraband |
| Stepping machine |

## Evidence

Describe a strengthening programme that you have supervised with a patient.

Describe what you did. Include information you gathered about:

| |
|---|
| The condition of the patient |
| Safety issues |
| The explanation you gave to the patient and obtaining consent |
| Choice of equipment |
| Preparation of equipment and location |
| Why these exercises were selected |
| Conducting the exercises, including<br>– *frequency*<br>– *intensity*<br>– *time*<br>– *type* |

## 9.15 Training for endurance

Exercises to train endurance capacity of muscles will use low resistance or intensity but will involve many repetitions. The purpose of this training is to enable muscles to work moderately hard over a long period of time. It may be important in many areas of rehabilitation and will often be combined with strength training.

### Activity

Do the therapists on your unit train patient's muscles for endurance?
Find out in what circumstances they do this.

**Provide examples of the exercises that are used:**

- What equipment is involved?
- How are the exercises sessions structured?
- Is high or low intensity of exercise used?
- Is the number of repetitions performed low or high?

Once your supervisor feels you are ready, perform some endurance exercises.

### Evidence

Describe the difference between muscle strengthening exercises and exercises that train muscle endurance.

## Activity

Describe an exercise programme in which you supervised the patient performing endurance exercises as a whole or as a part of an exercise programme.

| |
|---|
| What was the difference between these and strengthening exercises? |
| What went well? |
| What could have been better? |
| Anything you would do differently next time? |

## 9.16 Progressing an exercise programme

You may recognise that a patient has improved in certain parameters of exercise and that they should progress to more difficult exercises to continue improvement.

It may be appropriate for the therapist to review the patient, or you may be able to follow a protocol that allows you to progress the patient.

### Evidence

| |
|---|
| Describe here how you recognised that the patient was ready to progress and how you informed the therapist of this. |
| What changes were made to the exercise programme? |
| What principles were used to progress the exercise? |
| Describe how you implemented the progression and the outcome. |

## 9.17 Flexibility or joint mobility

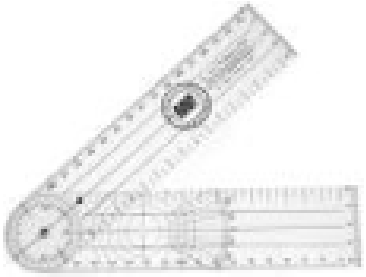
Joints may become stiff as a result of ageing, or diseases such as rheumatoid arthritis or osteoarthritis, immobility or surgery such as joint replacement or injury. When this occurs, the range of movement possible at the joint becomes limited. Reduction of joint range of movement can make even simple activities, such as standing up from a chair difficult.

It may be appropriate for the patient to undertake a programme of exercise specifically aimed at increasing flexibility and joint range of movement.

### Measuring range of movement

To monitor the effect of exercise on range of movement, it may be necessary to measure the range of movement at the joint before and after the exercises. Your supervising therapist will indicate if this is an appropriate activity on your unit.

**Range of movement** is the quantity of movement that occurs when a joint is moved to its full extent and is measured with an instrument that resembles a protractor called a **goniometer**. *(left)*



#### What to consider when measuring range of movement

- Do you have the right goniometer?
- You may require a large instrument for the hip, but a small one to measure finger movement.

## Activity

Find out which goniometers are available in your unit, and for which joints they are used.

Write what you find here.

**Where should the goniometer be placed on the patient to measure joint range?**

Much like a bicycle wheel, joints rotate around an axis. If joint measurement is part of your job, your supervising therapist will demonstrate the axis of movement of the joints that you will be measuring.

You need to position the goniometer over the axis of the joint, and to move one arm of the goniometer as the limb moves to its full range.

Ask your supervisor to demonstrate how to read the goniometer and how to record the result accurately in the records.

**What should you instruct the patient to do when using a goniometer?**

- Explain to the patient what you are going to do, and ensure that they have provided their consent.
- Position the patient to achieve optimal movement. Instruct them in the correct starting position of the limb.
- Ask them to actively move the limb through as great a range as they can.
- Ensure that the patient is moving the limb in the correct direction.

## Evidence

Provide details of having accurately measured a patient's active range of movement include details of positioning the goniometer, instructions that you gave, and how you ensured that the measurement was of full range.

Record the results appropriately below. Remember to record any pain or resistance to movement that you observed.

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| What went well? |
| What could have been better? |
| Anything you would do differently next time? |

## 9.18 Mobilising or flexibility exercises

When the need for mobilising or flexibility exercises has been established, you may be asked to assist the patient to perform mobilising exercises to increase range of joint movement.

- The exercises may be passive, where a sustained stretch to stretch a muscle further than the patient could on his own is applied.
- The therapist or support worker may apply the stretch. This is known as **assisted exercise**.
- The patient may assist the stretch by using their arms to pull the leg or other arm into a greater stretch. This is known as **auto-assisted exercise**.
- A wall or a step may be used to increase the possible stretch.
- The exercises may be active, where the patient uses active muscle contraction to achieve the stretch. This type of exercise may involve swinging of the limb, or pendular exercise, to increase the range of movement.

Usually when assisting a patient to stretch, the muscle is stretched to a point where the patient can feel the stretch, enough perhaps to cause mild discomfort, but not sufficient to cause pain. This type of stretch is known as static stretch, and is known as the most effective way of improving mobility at a joint.

### How long should a stretch be held?

The stretch at maximum point of stretch should be held for at least 15 seconds. Thereafter the stretch can be slowly increased. This should be repeated several times before returning to rest.

### Procedure for effective stretching:

- Explain the procedure to the patient and obtain their consent to proceed.
- Ensure that the area is clear and free from risk.
- Assist the patient to adopt the correct position for performing the exercises.
- Ensure that the patient's muscles are warmed up and relaxed.
- The patient should move slowly to a point of stretch.
- The patient should hold the stretch for at least 15 seconds.
- The stretch should then be slowly increased.
- The process should be repeated 3 or 4 times.
- Encourage the patient to relax and to keep the stretching muscle relaxed throughout.
- Guide and encourage the patient to remain relaxed.
- The stretch **must not** be forced. It is important therefore to observe the patient's response to the exercise, and to obtain feedback from the patient about how it feels.
- When the therapist or support worker is applying a stretch, care must be taken not to overstretch the muscle.

## Evidence

Demonstrate exercises to mobilise all movements at each joint.
Where appropriate, include passive, auto-assisted and active exercise.

What equipment might you use in each case?

Demonstrate to your supervising therapist how you would instruct a patient in mobilising exercises for the:

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| Shoulder |
| Elbow |
| Wrist and fingers |
| Hip |
| Knee |
| Ankle |

## Evidence

Describe in detail how you assisted a patient to perform mobilising exercises, and any measurements that you performed.

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| What went well? |
| What could have been better? |
| Anything you would do differently next time? |

### 9.19 Aerobic and activity-based exercise

Exercise that is of low intensity, but can be maintained for a long period of time may be described as aerobic. Such exercises include jogging, swimming and walking.

Such exercises are called aerobic because the individual requires increased oxygen consumption to provide the body with energy, and as a result breathes faster and has a higher heart rate.

Training in aerobic exercise increases an individual's capacity to use oxygen. The more oxygen an individual can utilise, the more they are able to perform basic activities with ease and prolonged activities without fatigue.

Such exercise also requires capacity for flexibility and muscular strength, and to some extent these aspects of fitness will be trained during aerobic exercise.

There is a general decline in aerobic capacity with age, which affects function, but it is clear that exercise can reverse the decline, along with improved flexibility and bone density.

In physiotherapy, aerobic exercise is used in cardiac rehabilitation to increase the strength of the heart muscle and also to increase the capacity of the other muscles to work efficiently over long periods.

As part of a general rehabilitation exercise programme, it may be appropriate and fun to include aerobic or activity based exercise. This may take the form of games or functional activities, such as stair or step climbing, walking, cycling on an exercise bike or exercise to music in an exercise class. It may also include functional household tasks such as gardening and cleaning.

Any exercise in which the patient's heart rate becomes increased will be considered aerobic. Exercises involving continuous activity such as cycling, brisk walking, swimming, jogging are very good for increasing aerobic capacity.Those which are good, but in which the aerobic benefits vary more, include racquet sports, circuit training, dancing, golf.

It is important to recognise that the intensity of the exercise must be appropriate for the individual, that the individual performs the exercise in comfort, and that any medical conditions are taken into account.

Generally, the therapist will prescribe the correct activity, intensity and duration of exercise for individual patients, or those to use in a group activity, and great care must be taken to ensure that any form of exercise is not too vigorous for the individual.

## Activity

Find out if patients that you work with perform aerobic type exercises as part of their rehabilitation.

This may include some activities in an exercise class, such as games, or using an exercise bike.

## Evidence

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| Describe what is meant by aerobic exercise. |
| Provide examples of activities that involve aerobic activities. |
| Describe how you carried out aerobic exercise or an activity based programme (this includes games, cycling etc that you might undertake in an exercise class). |
| Describe your preparation for the activity – the environment, the equipment, ascertaining if there had been a change in the condition of the patient. |
| Describe how you explained the activities to the patient(s). |
| Describe how you supervised the session, corrected and encouraged the patients. |

## 9.20 Assessment of aerobic fitness

This will usually be done by a therapist.

For cardiac patients, physiologists using a treadmill test, and laboratory equipment to measure heart rate and patterns of contraction of the heart, will perform the assessment.

**The therapist may use clinical tests too, such as:**

- **The shuttle run or walk test** The patient performs the test walking or running between markers in time with a timed beep.
- **Step tests** Stepping up and down off a step

**To monitor the patient's performance and comfort the therapist may use:**

- **Perceived exertion rating** The patient rates how they are feeling, which indicates whether the intensity of the exercise is comfortable
- **Measurement of heart rate** Pulse. This indicates how hard the patient is working, in comparison to the maximum rate for his age and condition.

In the cardiac rehabilitation class, the patients are taught to do this and work within a prescribed range of heart rate, to ensure that they achieve the correct intensity of exercise.

Find out what tests of aerobic activity are conducted with your patients.

## 9.21 Determining the correct exercises to increase capacity for aerobic exercise or function

Similar principles to those for the other types of exercise apply when the therapist prescribes aerobic exercise, and when assisting a patient to progress their fitness.

**Frequency**
Exercise performed three to five times per week is required to increase aerobic fitness.

This needs to be considered when planning exercise groups with patients

**Intensity**
For exercise to improve fitness, as for muscle strengthening, the exercise must be of an intensity to provide overload.

When a person is very unfit, benefits can be found with very gentle exercise. This will be the case with some of our patients. It is best to start with a relatively easy level of exercise.

As a person becomes fitter, a certain exercise level will be perceived as easier.

To progress the exercise for greater gains in fitness, the intensity should be increased gradually.

**Type**
- To increase aerobic capacity, exercise should involve the large groups of muscles such as the legs – but can be done too involving just exercise for the arms, for example with amputees.
- You will need to consider carefully which exercises are suitable to increase aerobic capacity or fitness in patients who can only use their arms.
- The exercise should enable the patient to elevate their heart rate and breathing rate.
- Be of an intensity that can be sustained for a prolonged period.

**Time or duration**
The exact time will depend on the individual, but 20 – 60 minutes is required to ensure optimal health. It may be difficult for the patient to initially exercise for even 20 minutes, so exercise should start for a shorter time, building up time and intensity as the individual becomes fitter.

Generally the therapist will prescribe the activities and progressions for patients undertaking aerobic or activity-based therapy. You may be involved in supervising patients who are undertaking aerobic activities.

Your therapist will indicate particular precautions with individual patients, but you should be able to determine signs of fatigue or distress and to take appropriate action.

## Evidence

- Describe how you carried out aerobic exercise or an activity based programme (this includes games, cycling etc that you might undertake in an exercise class).
- Describe your preparation for the activity – the environment, the equipment, ascertaining if there had been a change in the condition of the patient.
- Describe how you explained the activities to the patient(s).
- Describe the warm-up, cool down and the exercises performed and why they were chosen for this patient or this patient group.
- Describe how you supervised the session, corrected and encouraged the patients in their performance.
- Explain how you ensured the correct number of repetitions were achieved with appropriate rest periods.
- Explain how you monitored the patient for signs of fatigue, discomfort or distress – this may be using pulse-rate monitoring, as in the cardiac class, or simply your observations of the patient.
- Describe how you tidied equipment and how you left the patient(s).
- Report the patient's performance/progress to the physiotherapist, and in particular any change in the patient's ability to perform the exercises and the general condition of the patient.

Provide an example of how you recorded the exercise regime in the patient's treatment record.

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| What went well? |
| What could have been better? |
| Anything you would do differently next time? |

**Acknowledgements**
*NHS Tayside*

## 9.22 Supervision of active exercise workbook completion

Your supervising physiotherapist will sign your portfolio to indicate that you have completed this workbook successfully.

| Objective | Physiotherapist's signature | Date |
|---|---|---|
| Assess the individual patient's needs and abilities and addresses them appropriately | | |
| Demonstrate, teach and supervise individual patients who are undertaking therapeutic exercise | | |
| Demonstrate, teach and supervise patients in a group who are undertaking therapeutic exercise | | |
| Describe the physiological changes of exercise, and explain why they occur | | |
| Explain the purpose of warm-up and cool down | | |
| Effectively supervise patients when warming up and cooling down using appropriate exercises | | |
| Assess muscle strength in appropriate, selected patients, following a specified protocol | | |
| Effectively supervise a patient who is undertaking a strengthening programme | | |
| Supervise a patient performing endurance exercises as a whole or as a part of an exercise programme | | |

| Objective | Physiotherapist's signature | Date |
|---|---|---|
| Indicate that you recognise when patients are ready to progress, and that you can carry out the progression effectively | | |
| Accurately measure joint range of movement using a goniometer | | |
| Demonstrate different types of mobilising exercises at each of the main joints of the upper and lower limbs | | |
| Assist a patient to perform mobilising exercises | | |
| Effectively and safely supervise patients performing aerobic exercise | | |

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| **Support worker** (name) |
| Support worker's signature |
| **Physiotherapist** (name) |
| Physiotherapist's signature |
| Date |

## 9.23 Supervision of active exercise reflection

**Suggested KSF Dimensions: C2, HWB2, HBW7**
This form should be placed in the appropriate section of your portfolio.

| |
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| What did you learn from this module? |
| How has this influenced your work? |
| Date module completed |

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