

**HOME-BASED EXERCISE PROGRAMME  
FOR PEOPLE WITH SPINAL CORD INJURY**



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## **Introduction**

Spinal cord injury (SCI) at different levels result in different functional abilities depending on the distribution of muscle innervation. In fact people with SCI at identical levels (e.g. C5) may display different functional capabilities. Ideally it is recommended that exercise be prescribed on an individual basis so that the programme can be tailored to target the specific needs of the patient.

The aim of the following circuit programme is to provide a number of general exercises from which a patient may select those which they are capable of performing.

An inactive lifestyle has been shown to increase the risk of heart disease. In general the SCI population are less active and are at increased risk of developing secondary complications following their injury. Complications involving the heart, muscle and joints (especially the shoulder) are common. These issues are exacerbated by age-related changes that are increasingly problematic as the life expectancy of the SCI reaches that of the abled-bodied population. It has been shown that higher levels of activity can improve overall health and well-being in SCI individuals. Exercise interventions have the potential to reduce the complications of SCI and aid in improving independence and quality of life.

## **PRECAUTIONS**

Before embarking on an exercise programme the following things should be considered:

- Medical clearance should be sought from a physician.
- To prevent low blood pressure when exercising, an abdominal binder and/or compressive stockings should be worn.
- Use a security strap to ensure trunk support if abdominal and trunk control is reduced.
- Check your temperature, facial colour and sweating response for anything abnormal.

## **Disclaimer**

The exercises in this booklet are intended as a guide only. It is not intended to replace the advice of your physiotherapist. Some of the exercises may not be suitable for you. Therefore your physiotherapist may alter the exercises from those shown. Please discuss this with your physiotherapist and ensure that you fully understand the exercises that you require. Unless done correctly exercise can cause injury. If you are experiencing pain, please stop the exercising and consult your physiotherapist.

## **General information for the Patient**

The following exercise programme is designed for people with SCI who are long-term wheelchair users. The aim is to provide patients with a resource that they can use in their own homes with limited equipment. Arm ergometers have been shown to be particularly useful for increasing cardiovascular fitness in people with SCI. However this equipment is expensive. It was therefore decided to modify a 2<sup>nd</sup>-hand Exercycle in the hope of providing a cost-effective alternative.

The exercises have been selected based on a review of the current literature on cardiovascular and strength training in the SCI population. Because shoulder pain is a common problem among people following SCI, exercises have been designed to specifically prevent shoulder injuries.

## **Circuit Training**

It has been shown that circuit training increases both cardiovascular, and strength parameters and can also have psychological benefits.

A circuit consists of alternating strength exercises with cardiovascular exercises. Each exercise is known as a 'station' and participants progress from one station to the next.

It is important to set up the circuit in advance to minimise stopping between stations. Ideally rest periods should be between 15-30 seconds. This enables the heart rate to remain elevated so that cardiovascular and metabolic benefits are received.

The circuit will be divided into sections. 2 resistance stations will be performed after each other, followed immediately by 5 minutes of arm cranking. This will be followed by a rest period of 15-30 seconds, and then the 'section' will be repeated for exercises 3 + 4, and 5 + 6. This comprises one 'circuit', which will be performed twice in one session

Exercise 1	}	To be performed twice
Exercise 2		
<u>Arm cranking</u>		
<u>Rest</u>		
Exercise 3		
Exercise 4		
<u>Arm Cranking</u>		
<u>Rest</u>		
Exercise 5		
Exercise 6		
<u>Arm Cranking</u>		
<u>Rest</u>		

## **HOW, MUCH HOW OFTEN?**

The circuit should be performed 3-5 times per week. Results may not appear until approximately eight weeks. The key is to persevere and to make exercise a part of your daily routine. You should feel muscle soreness rather than pain.

### **Resistance exercises:**

When performing resistance exercises, do 15 repetitions (on each arm) in a row, for each exercise. You will be using either Theraband or hand weights, which are both readily available.

#### Hand weights:

To do most of the following strength exercises, you need to lift or push weights, and you need to keep gradually increasing the amount of weight you use. You can use the hand weights sold in sporting-goods stores, or you can use things like emptied milk jugs filled with sand or water, or socks filled with beans and tied shut at the ends.

Use a minimum of weight initially, then gradually build up the weight. Starting out with weights that are too heavy can cause injuries. At the same time, remember that you have to gradually add a challenging amount of weight in order to benefit from strength exercises. If you don't challenge your muscles, you won't benefit from strength exercises.

Take three seconds to lift or push a weight into place; hold the position for one second, and take another three seconds to lower the weight. Don't let the weight drop; lowering it slowly is very important.

#### Theraband:

Remember to have the Theraband firmly attached. Pull the band in the desired direction for 2-3 seconds, hold at maximal stretch for 1 second, and then slowly release. Try to maintain some stretch on the band even at its most slack position (i.e. don't return to a starting position where the band is slack).

#### Safety

Do not hold your breath during strength exercises. Breathe normally. Holding your breath while straining can cause changes in blood pressure. Avoid jerking or thrusting movements, instead use smooth, steady movements. Breathe out as you move the Theraband or weight, and breathe in as you relax.

When exercising with the weight or Theraband in one hand, you may need to hold the chair with the other hand to maintain balance. A security strap may also be necessary to add stability.

Muscle soreness lasting up to a few days and slight fatigue are normal after muscle-building exercises, but exhaustion, sore joints, and unpleasant muscle pulling aren't. The latter symptoms mean you are overdoing it. None of the exercises you do should cause pain.

### **Arm Cranking:**

You will perform five minutes of arm cranking per section. This will be divided into four minutes at a moderate level (base) and one minute at a higher intensity (peak).

The arm crank should be secured to a table at shoulder height, with the hand straps attached.

### **How hard should you exercise?**

The key is to listen to your body. Researchers have found that the level of effort you feel you are putting into an activity is likely to agree with what actual physical measurements would show. In other words, if your body tells you that the exercise you are doing is moderate, measurements of things like how hard your heart is working would probably show that it is working at a moderate level.

One way you can estimate how hard to work is by using something called the Borg scale. The 15-point Borg scale is illustrated below. As an example a 6 would be the equivalent of sitting down doing nothing, 13 a steady exercising pace and 19/20 the hardest exercise you have ever done. Your aim is to work at a 12-13 throughout the circuit (moderate – moderatley hard).

- 6
- 7 - Very, very light
- 8
- 9 - Very light
- 10
- 11 - Fairly light
- 12
- 13 - Moderately hard
- 14
- 15 - Hard
- 16
- 17 - Very hard
- 18
- 19 - Very, very hard
- 20 - Exhaustion

### Arm cranking:

During the four minute (base) period, continue to work at 12-13 on the Borg Scale. However for the one minute peak increase your intensity to 13-14 (moderately hard+).

### Resistance exercises (Theraband and hand weights)

Select a weight that you can lift or push 15 times in a row. If you can't manage 15 times in a row, it's too heavy for you. Reduce the amount of weight. If you can lift a weight more than 20 times in a row, it's too light for you. Increase the amount of weight.

### **Equipment**

Arm Crank (can be modified from a second hand exercycle)

Theraband

Hand weights or wrist cuffs

Security Strap (if lack of balance is an issue)

## **CIRCUIT**

**WARM UP:** Begin with 5 minute of gentle arm cranking (10-11 on the Borg Scale)

### **STRETCH**

Stretches are to be performed with the wheelchair in a door way so that the arm to be stretched will just fit behind the frame without having to lean forward or backward in the wheelchair.

You should feel some tension in the muscle, but not a sharp pain. Hold each stretch for 20-30 seconds, and repeat for 2 repetitions. Stretching should never cause pain, especially joint pain. If it does, you are stretching too far, and you need to reduce the stretch so that it doesn't hurt. Mild discomfort or a mild pulling sensation is normal. Never "bounce" into a stretch; make slow, steady movements instead. Avoid "locking" your joints into place when you straighten them during stretches. You should always have a very small amount of bending in your joints while stretching.

Below is a list of stretches, perform those which you are able.

### **CIRCUIT:**

Below are 10 resistance exercises. Trial the exercises, and select from the list those that you can manage. Your aim is to have at least 6 different exercises. If you can complete more than six exercises, either add the others to the circuit (depending on how long it takes you) or select six on one day and vary the exercise so that you perform a different selection of the following exercise day. Most exercises have a second exercise following that can be used as a progression.

Perform your first exercise, followed immediately by the second. After completing the second exercise, begin the arm cranking station (four minutes, at 12-13 on Borg Scale, followed by one minute at a 13-14). Rest for 15-30 seconds, then repeat the same procedure for your third and fourth exercise, followed by your fifth and sixth. Now complete the whole regime through once more!!

**COOLDOWN:** 2 minutes of gentle arm cranking (7-8 on the Borg Scale).

### **PROGRESSING**

Every 6 weeks your exercise programme should be reassessed. If the circuit is becoming easy you can progress it in a number of ways:

Increase the base of the arm cranking by one minute

Increase the peak of the arm cranking by thirty seconds

Increase the number of repetitions on the resistance exercises by five

Gradually increasing the amount of weight you use

# CIRCUIT

## Warm up

Exercise 1

Exercise 2

Arm cranking

Rest

Exercise 3

Exercise 4

Arm Cranking

Rest

Exercise 5

Exercise 6

Arm Cranking

Rest

To be performed twice

## Cool Down

**All stretches are to be held for 20-30 seconds, and performed twice on each side.**

**Stretch 1:**



- With elbow at shoulder height and elbow bent to 90°, place forearm on door frame making contact from elbow to wrist
- Lean slightly forward until a firm stretch is felt in the chest region, keeping elbow and wrist in contact with the frame at all times
- Repeat with other arm

**Stretch 2:**



- Place outstretched arm at 45° from your body, elbow straight and thumb up
- Place lower forearm against the door frame
- Rotate wheelchair AWAY from arm until you feel a stretch in the front of your arm
- Repeat on other arm



**Stretch 3:**



- Lean forward. Cross your arms and grasp your thighs near your knees
- Pull your trunk up and back (still holding your thighs)
- You should feel the stretch between your shoulder blades



**Stretch 4:**



- Place one arm straight out in front of you, palm facing in
- Move your arm to cross your body, keeping your shoulder down
- With opposite hand pull the arm into your body, while keeping the elbow straight

### Stretch 5:



- Sit tall in your chair
- Tilt your head so that your ear moves toward your shoulder on the same side (keep the opposite shoulder down)
- Repeat on the other side

### Stretch 6:



- Place one arm in the air above your head
- Bend at the elbow and reach as far as you can down your back
- With the other arm add resistance by pulling the elbow across
- Repeat on the other side



### Stretch 7:



- Sit tall in your chair
- Rotate your body to the left
- Use your arms to help pull you around
- Repeat on the other side

**RESISTANCE EXERCISES: remember to hold onto your chair for balance, when exercise one arm. A security strap may be used to add stability**

**exercise 1a (external rotation)**



- Position yourself parallel to a closed door
- Attach the band to your wrist or hold in your hand that is furthest from the door and to the door handle
- Place yourself far enough away so that the band's tension allows your hand to rest on your abdomen, with your elbow bent to 90°, and at your side



- Without moving your elbow, pull your wrist away from the door as far as you can
- Your elbow should stay at your side and bent throughout the motion
- Return slowly to the starting position
- Complete 15 repetitions. Repeat with other arm

**To progress from the above exercise use hand weights:**

**exercise 1b (external rotation)**

- Holding a weight or with wrist cuff attached, begin with your shoulder out to the side at 90°, elbow bent to 90°, and palm facing down
- While keeping the shoulder and elbow in this position, move your forearm toward the roof as far as it will go.
- Return slowly to the starting position.
- Complete 15 repetitions. Repeat with the other arm



### **exercise 2a (internal rotation)**



- Position yourself parallel to a closed door
- Attach the band to your wrist or hold in your hand that is closest to the door
- Place yourself far enough away so that the band is taut when your elbow is bent to 90° and at your side



- Keeping your elbow at your side and bent, pull your forearm away from the door and bring your wrist to sit on your abdomen
- Your elbow should stay at your side and bent throughout the motion
- Return slowly to the starting position
- Complete 15 repetitions. Repeat with other arm

**To progress from the above exercise use hand weights:**

### **exercise 2b (internal rotation)**



- Holding a weight or with wrist cuff attached, begin with your shoulder out to the side at 90°, elbow bent to 90°, and palm facing down
- While keeping the shoulder and elbow in this position, lower your forearm, until your fist faces the floor.



- Return slowly to the starting position
- Complete 15 repetitions. Repeat with the other arm

### **exercise 3a (scapular retraction)**



- Attach the band to your wrists or hold in each hand
- Face the door so that the band is in front of you with your arms straight
- With the arms at chest level, pull back in a rowing motion
- Return slowly to the starting position
- Complete 15 repetitions



**To progress from the above exercise use hand weights:**

### **exercise 3b (scapular retraction)**

- Holding a weight in each hand or using wrist cuffs, begin with arms straight out in front of you
- Pull your elbows out and back in a rowing motion
- Return slowly to the starting position
- Complete 15 repetitions



#### **exercise 4 (shoulder adduction)**



- Turn wheelchair so that you are at a 90° angle to the door
- The band should be attached to the door knob and to your wrist or held in your hand that is closest to the door
- Pull your wrist down toward your side while keeping your elbow straight and thumb pointing forward



- Return slowly to the starting position
- Complete 15 repetitions. Repeat on the other arm

#### **exercise 5a (shoulder abduction)**



- Sit in your chair with your arm hanging down over your wheel with your elbow straight
- Attach the band to your chair at floor level and to your wrist on the same side
- Pull your arm out and up towards shoulder level while keeping your elbow straight and thumb pointing forward or slightly up



- Return slowly to the starting position
- Complete 15 repetitions. Repeat on the other arm

**To progress from the above exercise use hand weights:**

**exercise 5b (shoulder abduction)**



- Sit in your chair with your arm hanging down over your wheel. Hold a weight or attach wrist cuffs.
- Extend your arm out to the side (keeping your elbow straight) until shoulder height
- Return slowly to the starting position
- Complete 15 repetitions. Repeat on the other arm



- N.B. If this is too difficult bend the elbow to 90°, and keep in this position throughout the movement

**exercise 6a (bicep curl)**



- Attach the band to your wrist (or hold in your hand) and to your chair, near the floor, on the same side
- Begin with arm straight , palm facing forward
- Bend at the elbow, until hand is in front of your shoulder
- Slowly lower your wrist to the starting position



- Complete 15 repetitions. Repeat with the other arm

**To progress from the above exercise use hand weights:**

**exercise 6b (bicep curl)**



- Hold a weight in your hand or attach wrist cuffs
- Start with your arm hanging straight down beside your chair
- Keeping the shoulder still, bend at the elbow, bringing hand toward your shoulder



- Slowly lower your wrist to the starting position
- Complete 15 repetitions. Repeat with the other arm

**exercise 7a (tricep extension)**



- Attach the band to your wrist, and to the wheel of your chair
- Begin with your elbow bent and close to you body
- Straighten your elbow until inline with the back of your chair (elbow remains at your side)



- Return slowly to the starting position
- Complete 15 repetitions. Repeat with the other arm

**To progress from the above exercise use hand weights:**

**exercise 7b (tricep extension)**



- Holding a weight or with wrist cuff attached, begin with your arm straight above you
- Keeping your shoulder in this position, bend at the elbow, so that your hand moves behind your head
- Return slowly to the starting position
- Complete 15 repetitions. Repeat with the other arm



**exercise 8a (anterior deltoid)**



- Attach the band to your wrist, (or hold in your hand) and to the chair near the floor
- Begin with your elbow as straight as possible and down beside your chair
- Raise your arm, with your elbow remaining straight, until inline with your shoulder
- Return slowly to the starting position
- Complete 15 repetitions. Repeat with the other arm



**To progress from the above exercise use hand weights:**

**exercise 8b (anterior deltoid)**



- Holding a weight or with wrist cuffs attached, begin with your arm beside your chair
- With your elbow straight and your palm facing down, straightened your arm in front of you, until shoulder height
- Return slowly to the starting position
- Complete 15 repetitions. Repeat with the other arm



**exercise 9a (shoulder girdle depression)**



- Sitting in your chair, lean slightly forward, keeping your back and shoulders straight. Grasp the seat of the chair.
- Slowly lift yourself up, by straightening your arms.
- Slowly lower yourself back down
- Repeat 15 times



### **exercise 10 (chest, pectorals)**

- Attach two bands to a door knob behind you.
- Drape the Theraband over each shoulder and attach to you wrist (or hold in your hands)
- Start with your hands near each shoulder, and move your arm in a circle out and forward, until they meet in front of you (as if hugging a barrel)
- Return slowly to the starting position. Complete 15 repetitions



**To progress from the above exercise use hand weights:**

### **exercise 10b (chest, pectorals)**



- Holding weights or with wrist cuffs attached, begin with both hands by your shoulders
- Start with your hands near each shoulder, and move your arm in a circle out and forward, until they meet in front of you (as if hugging a barrel)
- Return slowly to the starting position.
- Complete 15 repetitions

