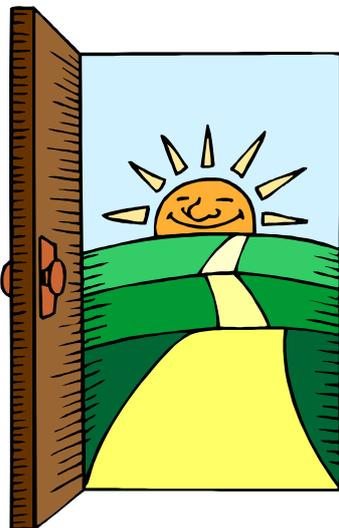


## **Sensory re-learning for the hand - after nerve repair - Phase 2** *(page 1 of 5)*



After a nerve injury in the hand, wrist or arm, there is a loss of feeling (sensation) in the area that the nerve used to supply. It can help to think about this as cutting the electric cable that supplies electricity to a lamp – once the cable is cut, the light goes out. However, unlike an electric cable where the copper wires can be re-joined, in the body new nerve fibres have to regrow from the point of injury. As a rough estimate, for about a year, the nerve fibres regrow at 1mm a day. However, once the nerve has regrown, it still takes time for the sensation to return to normal - often between 3 to 5 years. The recovery of normal sensation is affected by many factors and is not guaranteed. Sensory re-learning techniques may help to give the nerve the best chance of recovery.

Recovery of feeling in the hand involves the whole of the nervous system: both the nerves in the limb and the brain. The brain receives, interprets and understands the sensation from the hand and processes these inputs in a dedicated area of the brain – we call this the handmap. As new nerve fibres grow, the brain has to learn to communicate with these new nerves, which involves the brain having to re-programme the sensations that it feels by re-organising the handmap. We call this process of re-programming the brain plasticity.

Goran Lundborg, a hand surgeon who has done much research in this area, says that after nerve injury and repair, “the hand speaks a new language to the brain”. Rather like learning any new language, there are exercises that you can practice. These will help you to gain the best recovery in sensation that you can. The amount and quality of sensory recovery that can be achieved is individual and depends on a wide range of factors including the nature and severity of your injury and your age. Full normal recovery is very unlikely, so achieving the best possible result through sensory re-learning exercises is very important.

All of the sensory re-learning exercises require the same effort on your part as are needed to learn any new skill – patience, practice, attention, repetition and most importantly, the motivation to do it. The exercises are best completed little and often, in a relaxed, pleasant and quiet environment. Throughout the whole of your rehabilitation period you will be encouraged to learn how to use your hand as normally as possible, despite loss of feeling. However, you must make sure that your hand is safe and be careful around dangerous objects, especially those that are sharp or hot. The exercises involve the need to think about what you are feeling and

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Name: Megan Robson  
Role: Clinical Specialist Occupational Therapist  
Date written: April 2016  
Last reviewed: Nov 2018  
Review due: Nov 2021  
Version: 1.1  
Code: PI1394

seeing in your injured hand, as compared to your uninjured hand. This type of concentration will help your brain to think about what it should be feeling, compared to the new disordered information it is receiving. Where possible it helps to complete exercises where other senses can also be used such as smell, sound and taste. Using other senses that are working normally will help to improve the re-learning process.

## Exercises for Phase 2

At this stage the new nerve fibres are beginning to reach into the hand and will start to send signals to the brain. However, the signals are not normal and the feelings will be of pins and needles and electrical types of sensation. It will be hard to distinguish temperature and different textures. Some of the new nerves may have grown into different areas of the hand compared to the original nerve but your brain will be expecting the nerve to end where it did before the injury. This can lead to strange sensations that we call cross innervation. For example, you might touch your index finger, but feel the sensation in your palm or thumb. Sensory re-learning exercises are designed to help the brain re-programme so it can better communicate with the new nerves growing into your hand.

At this stage of the re-learning programme you will concentrate on:

- Where the touch is
- What it feels like
- How it should feel.

By this point in your rehabilitation you should be using your hand well in everyday activities – despite sensory loss. You will need to be very careful not to damage your hand, such as from sharp objects or heat. You will also find it impossible to work with your hand where you cannot see it. Use your hand as much as possible, but make sure you are safe; for example using insulated mugs, until your hand has enough protective sensation to identify heat. By using your hand as normally as possible in everyday tasks you are giving your brain lots of opportunities to go through the process of sensory re-learning.

During these sensory re-learning tasks it is important to take time to think about how the objects feel and the other senses that are used as part of the overall experience. For example, the task of opening a crisp packet and eating crisps has lots of rustling sounds and smells. However there is evidence to suggest that it is also worth taking time to complete the dedicated exercises below.

Where possible, these exercises should be completed little and often during the day. Ideally you should be relaxed in a pleasant, comfortable environment and able to pay attention and concentrate on the exercises.

## 1. Touch your hand with and without sight

Whilst you are watching your injured hand carefully, touch your hand with a safe object, such as the rubber on the end of a pencil, or scratch it lightly with your nail. Very gently move the object so the stimulus is always slightly moving – this will give your nerves the best chance of picking up the sensation. Think about **where** the feeling is and **what** it is like. Repeat the exercise on a part of your hand that has normal sensation, or on the corresponding area on your other hand. Again, think about **how** the sensation feels different on the skin that has normal sensation compared to the damaged area. Stick to using a few areas of your hand such as in your palm, where you have some basic awareness of sensation returning.



When you feel you can recognise this touch with your eyes open, repeat the exercise with your eyes shut. Concentrate hard to think about the location and texture of the object. Then open your eyes and watch where you are touching.



Repeat the exercise with eyes open and eyes closed. Complete the exercise 'little and often' throughout the day, to stimulate your brain to take notice of your hand.

## 2. Identification of textures

Gather together a small selection of different textured materials, but make sure they are not harmful. These should be materials that are familiar to you and can be found easily around your home. It helps to have materials that go from rough to smooth textures such as a soft nylon scouring pad (the sort used for non-stick pans), towelling, sheepskin, wool, cotton and silk. Start your sensory re-learning exercises with the roughest materials.



With your injured hand, feel and handle the first material. Do this with your eyes open and then shut and then reopen. Repeat this task with your uninjured hand. Repeat again, with your injured hand. As before, think about the material:

- What does it feel like?
- How does it feel compared to the uninjured hand?
- What sound does the material have?
- Does it have any smell?
- Does the material have any associations in your mind?

By moving the texture from one hand to the other, you are forcing your brain to think about the texture using all your senses – the normal sensation in the uninjured hand and other senses such as sound. This will stimulate the area of your brain that is receiving information from the new nerves and encourage the process of sensory re-learning.

As time goes by and your sensation improves, put the textures in a small bag or pillow case. Test yourself by using your injured hand to try to find a particular piece of material – without sight. As you improve, find textures that are harder to tell apart.

### 3. 'Mindfulness' exercises - purposeful task that use all of your senses

Take time to complete simple tasks that give your brain a lot of opportunity to stimulate other senses such as using both hands to peel and eat a satsuma, unwrapping and eating a piece of chocolate, opening a packet of crisps and eating them.



Think about the task:

- How does the object feel in your injured hand?
- What else can you smell and hear?
- Watch your hands completing the task.

### 4. Identification of objects



In the same way that you used textures, select a small number of objects that you can use to complete the same exercise of identification such as an eraser, key, coin, nut, toothbrush, domino pieces. Concentrate in particular on the noise the objects make and whether the object feels cold or not.

As time goes by and your sensation improves, you can make the objects harder to identify. For example try to select different types of coins or find a coin as distinct from a button. It can be

helpful to carry a few of these objects in your coat pocket to practice these identification skills little and often during the day.

As you make further progress, you can make this much more difficult by trying to feel and identify simple braille symbols. These are easy to find on the packaging of most medications. However, be warned! Many people never manage to get enough recovery in their nerve function to complete such a difficult task.

### 5. Localisation of touch

As the sensation in your hand recovers, you will begin to get the awareness of touch. However, to begin with, unless you can see your hand, you may not be accurate about identifying the correct spot where you are being touched. To start with it is very common to think the feeling is closer to your wrist than it actually is, or on the finger next to the one being touched. The ability to identify the exact spot where your hand is being touched is called localisation. With the help of someone you trust you can practice getting the sense of feeling on your hand more accurate. Ask your friend to touch your hand with their finger, whilst you have your eyes closed. With your



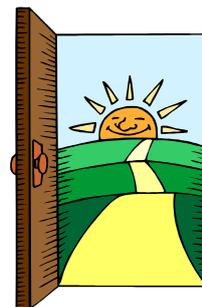
uninjured hand point to where on your hand you think you were touched. Open your eyes to look at the difference between the points, that is the one where you were touched and the point that you felt. Ask your friend to repeat the test – with your eyes open and closed - to help your brain re-learn this sense of feeling. Then repeat the test on a different part of your hand. Take the task slowly and do not continue for too long or your brain will become confused. As with many of these sensory re-learning tasks, little and often is best. However, please note – the ability to localise a feeling is not easy to do, even when your sensation is completely normal.

The recovery of sensation in your hand will depend on a wide range of factors. The new growing nerves of the hand are intimately linked with the brain in regaining a wide range of sensations including touch, vibration and temperature. By doing these simple, repetitive exercises you will be helping your brain to re-learn how to use and interpret the information from the new nerves in your hand.

If you want to read more about the science behind sensory re-learning, see the articles below.

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**Hand Therapy - 01722 345530**

**Wessex Rehabilitation Centre 01722 336262 ext 2370**