Sensory relearning

FOLLOWING NERVE REPAIR

REGION SKÅNE

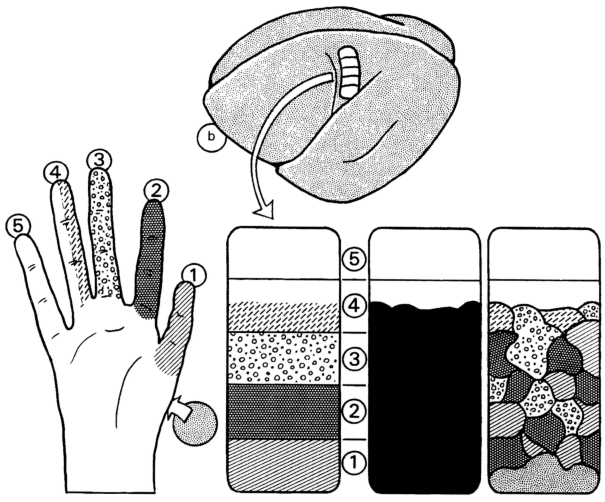
What happens when a nerve is repaired?

After a nerve repair sensibility and muscle function in parts of the hand are lost, leading to decreased grip function, and intolerance to cold is common.
After the surgery when the nerve sheath is repaired new nerve axons grow into the skin and the muscles. It takes a long time for the nerve to grow, approximately 1 mm per day. The result is a *new* sensibility that you have to learn to interpret. We say that the hand *"speaks a new language to the brain"*.
Hypersensitivity to light touch is normal during this growth period but can be influenced by so-called desensitisation when the skin gradually gets used to normal touch again.

The brain has a detailed map of the body where touch is registered and interpreted. Touch from the right hand is mainly processed in the left part of the brain, but both halves of the brain are active during perception of touch. All our senses cooperate when we touch something, for instance vision and hearing can help to strengthen touch.

A repaired nerve means that the brain programme for interpretation of touch input for a period of time is silent since there is no or very little sensibility in the hand (phase 1). During this time no protective sensibility is present and it is of great importance to use visual support when using your hand to prevent further injuries. During this period the handmap in the brain is also rapidly "occupied" by adjacent areas and is changed. When the new axons have grown to the skin, and to the muscles, the map is again changed since the axons don´t grow in exactly the same paths as before the injury. The handmap becomes unstructured, a mosaic -like pattern, and the sensibility during this time is not very useful. You need to use vision to understand what the hand is touching (phase 2).

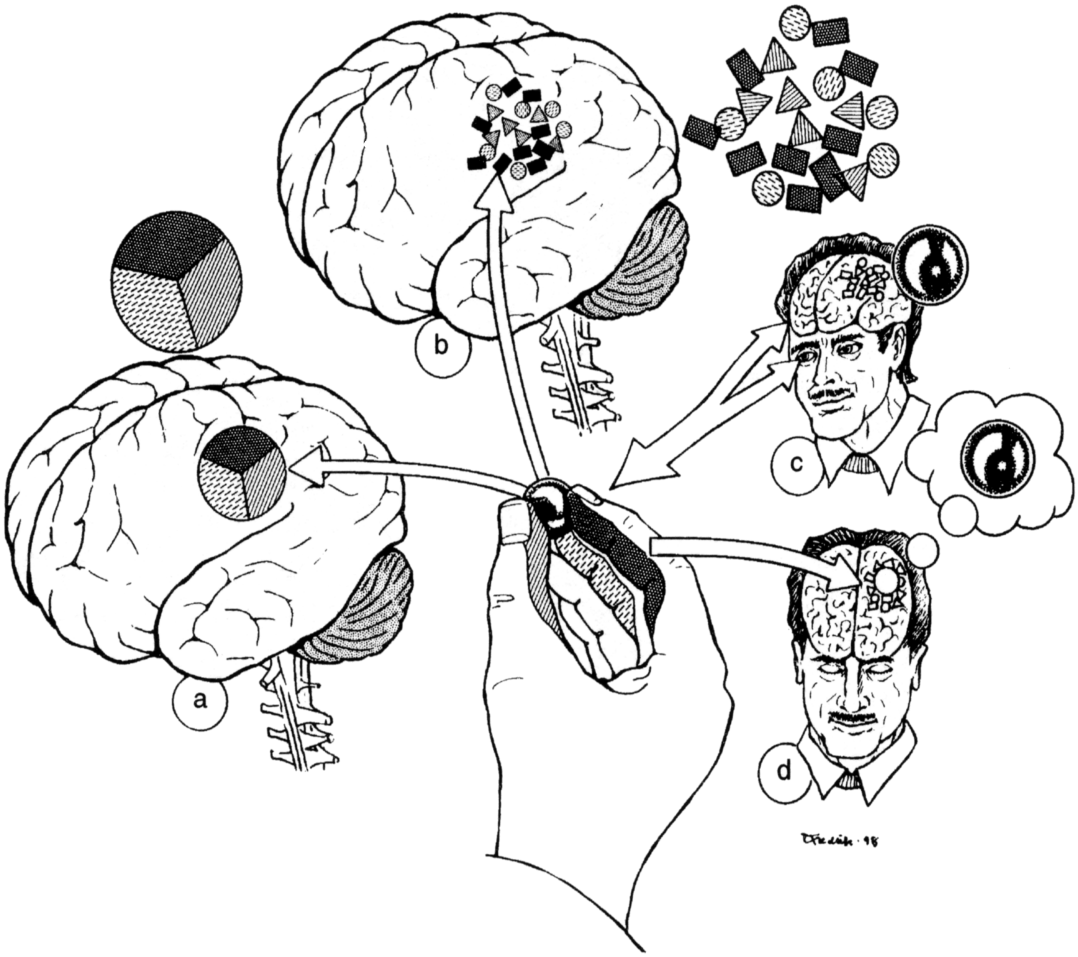
This functional reorganisation of the brain is a natural process and depends on the brain´s capacity to adapt when the body sends new signals.



Picture of the changes occuring to the handmap of the brain following after median nerve transection.

Why is it necessary to do sensory relearning exercises?

With regular and structured training you can learn to understand the new *"language"* from the hand. With no training at all the brains interpretation of the new nerve signals will be random and the result can be that the simplest touch feels strange. Control over the sensory input gives a better grip function and makes it easier to use the hand in daily activities.



The principles of sensory re-education after median nerve repair. (a) gives a schematic illustration of the "handmap" in an uninjured person touching a marble. After nerve transection a regrowth of nerve fibres the map is altered due to misdirected nerve fibres and following functional reorganisation (b). By combining visual and sensory information together to learn the brain to understand the "new language" from the hand.

Sensory relearning

You and your therapist compose a training programme to improve the functional sensibility based on how much the nerve has grown.

The training session, meaning focused exercises for 5-10 minutes, should be done several times per day. Make sure you are in a quiet and comfortable place where you can concentrate on the relearning in a conscious manner.

Relearning in phase 1

The sensory re-learning in this early phase, in combination with training of the mobility of the hand, is aimed to enable return to everyday activities and to handle the demands it entails.
In phase 1 the hand is without sensibility and the handmap in the brain has disappeared. This phase lasts up to three months after an injury at wrist level and encompasses the period direct after surgery until some growing axons have reached the palm of the hand.

During this time no protective sensibility is present and it is of great importance to visually support the hand during activity to prevent it from further injury trough burns or cuts etc.

Hypersensitivity in the skin is common following nerve injuries and can be treated by desentisation exercises. Also cold intolerance is a common consequence following nerve injuries. Your occupational therapist can advise you on how to handle cold sensitivity.

This is done by giving the brain an illusion of sensibility in the hand, and is a preparation that activates the somatosensory cortex of the brain.

How to do the training:

- Think about how the touch feels - preferably something that you like to touch (picture 1). Close your eyes and concentrate on the sensation.
- When you see someone else touch things, think about how such touch normally feels (picture 2). Think about Think of materials, temperature, hardness-softness, shape, surface and structure
- You can touch the fingers without sensibility and the corresponding fingers on the other hand simultaneously and in exactly the same manner (picture 3).
  When the cast is removed this exercise can be alternated with everyday objects (picture 4)
- You can ask someone else to touch the fingers without sensibility and corresponding fingers on the other hand simultaneously while you watch carefully (picture 5).
- Another way is to use a mirror (picture 6) positioned so you can see your uninjured hand in the mirror looking like the injured hand. In this way you create an illusion that means that the brain thinks there is activity in the injured hand.

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Relearning in phase 2

In phase 2 the axons have reached the hand and the hand map in the brain has a changed pattern. This is approximately three months after a nerve repair at wrist level and you have some sensibility in the palm and it is time to start relearning with phase 2 exercises.

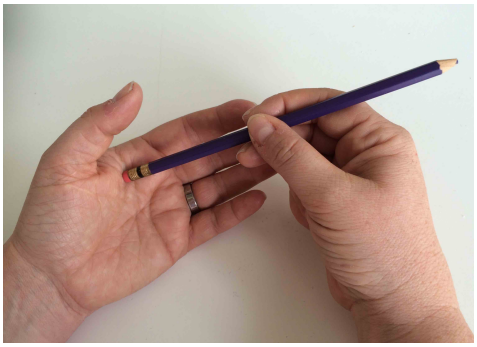
How to do the training

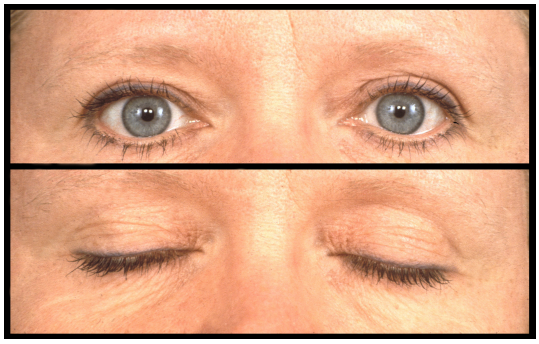
Training technique:
If hypersensibility in the skin is present, start with desensitisation exercises.
2 Shift between open and closed eyes.
3 Concentrate and look at the hand during the touch. Continue the touch but now with closed eyes.
4 Try to connect what you feel with closed eye with what you just saw.

Since the regrowing axons do not grow to exactly the same place as before the injury, you have to learn to localize the touch.

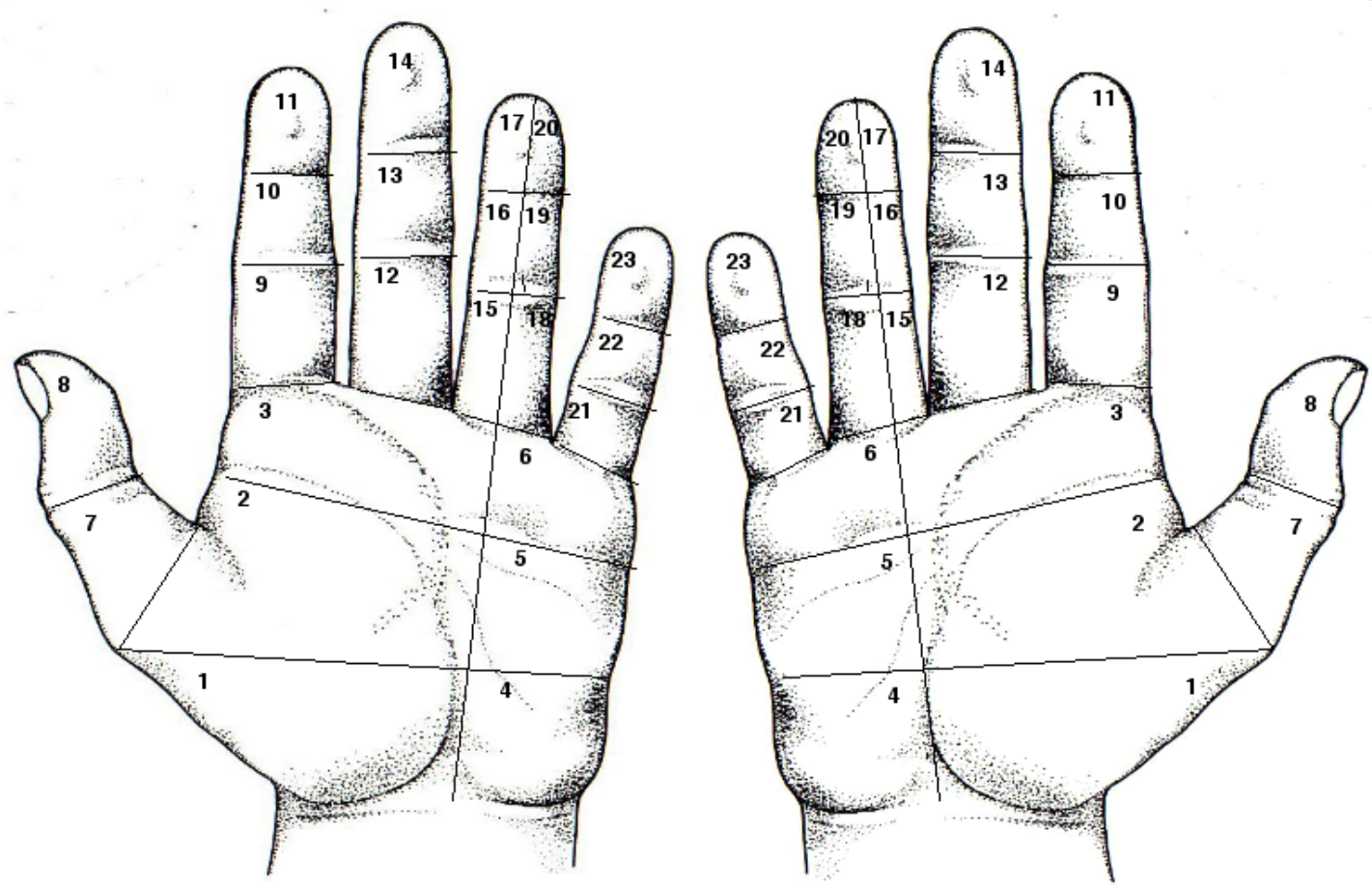
- To localise touch, touch your skin in one of the areas marked in the template on the next page with a blunt object e.g. a pen.
- Concentrate on **WHERE, WHAT and HOW** when touching the hand.
- Press or move the object hard enough for you to perceive the touch. Compare to an area where you have normal sensibility. Preferably you can work in an area close to an area with normal sensibility.

Work on a few areas first until you are sure that you can localize the touch correctly. Then move to adjacent areas, nicer and more complicated touch (different directions, different shape).





You can ask someone to help you to ensure that you really are able to identify where and what you sensate without looking. Use the template below as a help.



When you have some protective sensibility in the fingertips it is time to start exercises to relearn to differentiate between different textures and shapes and to identify objects.

Your occupational therapist will guide you to exercises at the right level depending on the nerve regeneration.

Training technique:

If hypersensibility in the skin is present, start with desensitisation exercises.

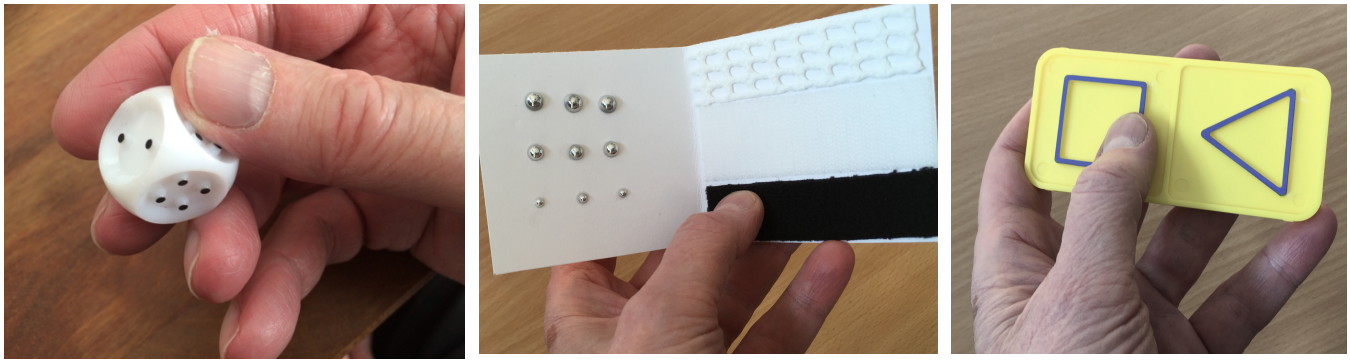
2 Shift between open and closed eyes.

3 Concentrate and look at the hand during the touch. Continue the touch but now with closed eyes.

4 Try to connect what you feel with closed eye with what you just saw.

Examples of how the training can be performed:

		
Touch a hidden object with your injured hand and try to identify it	Compare the feeling of the hidden object with the ones you see and try to match them	Was it a correct match? If not – watch and feel – then go back to Picture 1 and ask someone to present a new hidden object.



Examples of specific training equipment that you can borrow from your occupational therapist

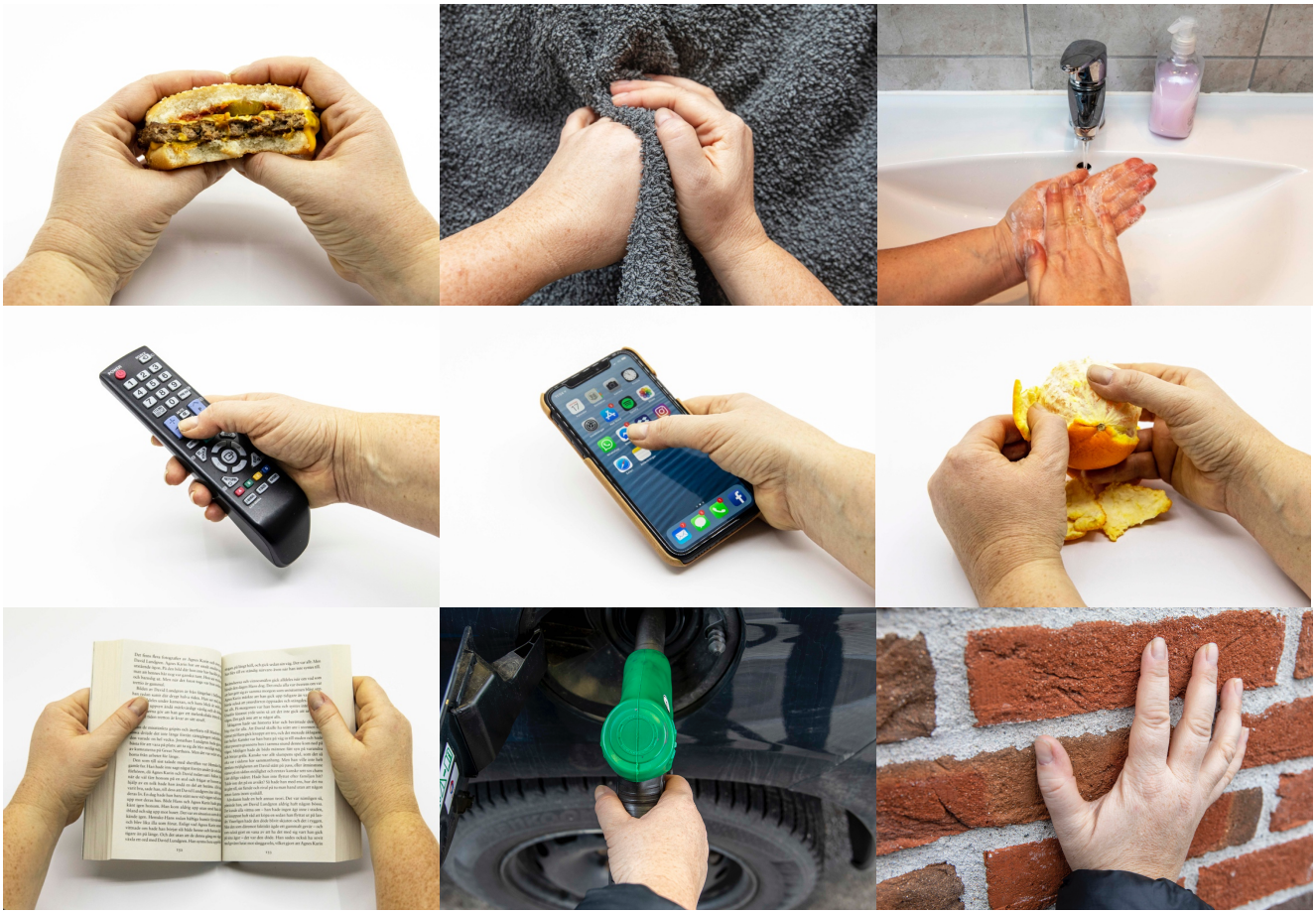
A tip is to carry a few objects in your pocket and try to identify them. In this way you can perform the relearning principle several times a day, i.e. every time you handle your keys.

Think about the size, shape, texture, weight and which of object you are touching.

Use all your senses to enhance the sensibilty. For example, when eating a fruit, think of the taste, the smell, the sound, the color when you handle it a “tactile meal”

It will help you re-learn the sensibility in your hand if you make it a rule to think about the sensibility of everyday objects when handling them.

Concentrate on what you feel, and e.g. the size of the object, is it a soft or hard object, with sharp or blunt edges, what is its shape, size, temperature, weight and texture?



During the rehabilitation regular follow-ups are done to see how sensibility and hand function improve and to upgrade your sensory re-education programme.
The sensory and motor recovery after a nerve repair takes long time, and with active use of the hand and training, improvements can be seen several years after the injury.

If you have any questions your occupational therapist will be happy to assist.

GOOD LUCK with your sensory re-learning programme!

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