Treating Phantom Limb Pain: Mirror Therapy

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Background on Phantom Limb Pain

• PLP refers to the pain felt in the amputated body part, not the pain that may be felt in the stump
• PLP affects approximately 80% of all amputees
• Amputees may feel the pain immediately after surgery or years afterwards
• The PNS and CNS are both thought to play a role creating the sensation
Common Symptoms and Possible Causes

• A patient may describe the sensation as follows:
  ▪ Cramping, tingling, burning, shooting, throbbing
  ▪ Muscle spasm

• Research suggest that the damaging of the central and peripheral neurons may create a **neuropathic** type of pain.

• The messages of neurons are either affected by the lack of regular sensory activity or the hyperactivity correlated with the abnormal firing of the damaged nerves.
Associated Brain Changes

• After amputation, the brain may experience reorganization within the somatosensory and motor cortex.

• In particular, the area which used to correspond with the amputated limb is taken over by other neighboring representational areas.

• The nociceptors of the stump or the surrounding areas may then produce sensation in the phantom limb.

• The greater amount of abnormal cortical reorganization positively correlates with the amount of pain and the size of the affected area.
The different parts of the body each have their own representation zone within the brain. The various areas are quite close to each other. Therefore, one can picture how reorganization of the cortex may result in an abnormal sensation in another part of the body.

The image acts a representation of neuromagnetic source imaging which defines the localizations of the hand and mouth regions on the cortex. The green squares represent the hand region while the yellow circles represent the mouth area. Upon observing the hemisphere associated with the amputated limb, one can see that the mouth region has taken over former area of the hand.
Concepts Behind Mirror Therapy

**Basis:** *Vision has a strong effect on perception and movement*

- The mind accepts other objects as part of the body (like the limb’s reflection) more readily if there is a great amount of similarity between sensory modalities.

- **Mirror therapy works to:**
  - diminish the visual-proprioceptive dissonance
  - produce the illusion of two intact limbs.
  - restore of the missing limb representational area within the cortex.
  - create “matching” bilateral visual and proprioceptive input
Concepts Behind Mirror Therapy

• Studies show mirror neurons are activated either when one performs an action or when one observes another performing an action.

• An amputee would not receive the same null input as a non-amputee and would instead feel a sort of tactile sensation in the amputated limb.

• The activation of mirror neurons may act to block pain perception in the phantom limb.
How to Use Mirror Therapy

• Provide verbal and visual instructions
• Position patients with vertical mirror between their arms and legs
  ▪ Note: Patients need to see the reflection of the intact limb
• Cater exercises to patient’s pain
• **Ex:** Patient complains of *phantom hand pain*
• **Exercises could include:**
  ▪ Opening and closing the fingers without contact and with the palm facing the mirror
  ▪ Extending the fingers with the palm towards the mirror
  ▪ Supinating and pronating the wrist
  ▪ Circumduction without actual contact
  ▪ Using the index finger to trace figures in the air
How to Use Mirror Therapy

• Examples of potential patient positioning:
Summary

- Mirror therapy works to “trick” the brain into perceiving the reflection of the intact limb as part of the affected side. The brain may then process the perception and sensation of the amputated limb as if it would the intact limb.
- The patient can then experience alleviation as the brain responds to the reflection as if it were the affected side.
  - Ex: unclenching the unaffected hand could allow the phantom hand to feel relief as well.
- Mirror therapy can be used at home which may provide patients with assuagement even when they are not able to come in for therapy.

Note: Mirror therapy may not work for all patients and other methods of should be considered for treatment as well.
References


