

Mirror Therapy: A New Approach In Phantom Pain Management

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1. Introduction to phantom pain

Following an amputation, people may develop pain. There are two pain categories: residual limb pain and phantom pain. Residual limb pain is caused directly by tissue injury during amputation, or by problems within the remaining part of the limb. Phantom pain is felt in the part of the limb that has been lost. Phantom pain is a common phenomenon that affects 50 to 80%¹⁻² of amputees during their lifetime. This problem remains complex and is not yet fully understood²⁻³. It is important to specify that phantom sensations following an amputation are normal (the feeling that the limb is still there), but that phantom pain (the feeling of pain in the phantom) is problematic.

Phantom pain is explained by two complementary theories that come from scientific research. The first theory is that the nerves which transmitted information from the lost limb have been damaged. After amputation, those nerves continue to transmit pain signals to the brain which continue to interpret them as coming from the lost limb, even though it is absent. The second theory is that the brain receives contradictory information and that it responds with pain signals. In all individuals, the brain possesses a graphic representation of the whole body which is not modified immediately after an amputation, still representing the lost limb. On the other hand, the brain receives information from the eyes showing that the limb is gone. Therefore, it may be this contradiction of information that creates pain. We can compare this pain to the seasickness feeling that is created simply by contradictory information going to the brain. When you are on a ship, your eyes perceive your body as being fixed while the vestibular system in charge of equilibrium perceives that your head is in continuous movement. The nausea felt would be caused partly by the brain response to this confusing information.

2. Description of mirror therapy

The use of mirror therapy was developed in the 1990's⁴. The principle is to reflect the healthy limb on the side that has been amputated. This way, the brain will interpret phantom sensations as coming from a full limb. Therefore, the sensations will be normal and not painful. The objective of mirror therapy is to block the arrival of contradictory information to the brain, so that clients feel less phantom pain⁴. For more than three years, the Institut de Réadaptation Gingras-Lindsay de Montréal⁵ has been developing a project on the use of mirror therapy with clients having phantom pain. Thus, as soon as they arrive in rehabilitation, a health professional

teaches them how to use mirror therapy. Our target clientele is the amputee who feels disturbing phantom pain regularly and who wishes to apply this technique at home. Many rehabilitation centres across Canada now use this treatment for phantom pain.

Clients selection criteria:

- 1) Have a limb amputation on one side only, leg or arm, at any level.
- 2) The limb on the opposite side must be healthy, without a wound or a scar that could modify the perception of the other limb.
- 3) Have the cognitive ability to understand the mirror therapy principle and application.
- 4) Supervision by a trained professional is recommended if the person:
 - a. Has anxiety or physical image problems;
 - b. Has a history of previous complex regional painful syndrome;
 - c. Has a history of “psychosis” (a disorder of thought or the mind involving loss of contact with reality, diagnosed by a psychological health professional).

Necessary equipment:

- 1) Mirror (preferably, a flat mirror to hang on a door) or any mirror big enough to see the full healthy limb well;
- 2) A chair or a wheelchair.

The general position:

Below are two examples, left for the upper limb (with forearm amputation) and right for the lower limb (with thigh amputation).



- 1) In seating position with the two bare limbs: lift sweater or roll up pants and remove all jewels, socks, shoes and any other element that could modify the limb perception.
Note: The whole non-amputated limb must be bare and completely healthy (no wound, important scar or any condition that could alter visual perception). If the non-amputated limb is not healthy, we suggest trying the therapy with the limb clothed.

- 2) Afterwards, the mirror must be placed in front of the person, between the two limbs, in an angle allowing him/her to see the two limbs in full and at the proper place, without distortion through the mirror (see picture). A pillow can be added behind the client's back if he/she must sit forward to be adequately positioned.

Caution: It is important to avoid skipping any steps and to follow the protocol carefully, because the illusion of a full limb following an amputation can cause an emotional shock. The awareness of the difference of sensation between the two limbs and the understanding of the role of the mirror therapy are necessary to its application. It is important to remember that mirror therapy could have negative effects on pain. Treatment should be ceased at all times if phantom pain increases during or after treatment.

3. Use protocol⁵

The training is usually done over a period of 4 days, but it may be extended for as long as the person has not succeeded in applying all the proper steps. At IRGLM, the protocol involves training by a trained physiotherapist who also determines the eligibility and relevance of mirror therapy for each person. He/she guides the client through the different steps and adapts treatment as needed depending on the results. Afterwards, a trained occupational therapist guides the client in integrating the therapy in his/her day-to-day activities at home. A follow-up allows assessment of the effect on phantom pain and the appropriate technique application. Below is a summary of the different steps:

Day 1: Awareness of phantom limb:

The objective is to become aware of the difference between the healthy limb and the phantom limb without the mirror. Close your eyes and become aware of the form, length, size, number of fingers/toes of the healthy limb and of the phantom limb and then compare the two limbs.

Day 2: Move the phantom limb without the mirror and visualize it with the mirror

- Without the mirror

1. Close your eyes
2. **Imagine** that the healthy limb moves (flexing, stretching, etc.), and concentrate on joints
3. **Imagine** that the phantom limb moves/try to move the phantom limb (flexing, stretching, etc.) and concentrate on joints

- With the mirror in position

1. Do not make any movement
2. Look at the limb through the mirror
3. **Imagine** that it is its contralateral limb (lost limb) and observe it
4. **Close** your eyes and concentrate on the changes in your pain

Days 3 and 4: Mirror therapy with movement

- With the mirror in position:

1. Redo day 2
2. Start movements with the two limbs; that is, move both limbs identically and simultaneously: the healthy one and the amputated one. These movements must be of small amplitude and started with the section that is the farthest from the body centre (fingers/toes then ankles/wrists, etc.).

If the person is able to succeed in this task, he/she is invited to apply these instructions once or twice a day. The therapy should generally last between 15 and 30 minutes. Duration should be determined according to the length of concentration (example: it could last only 5 minutes if concentration is not optimal anymore) or last the time necessary to diminish pain.

4. Conclusion

Mirror therapy is a way to relieve phantom pain in amputee clientele as a supplementary manner to other proven therapies. Medication remains the most efficient way to manage phantom pain. A consultation with your family doctor or specialist might be necessary in order to validate the relevance of using this form of therapy. This technique in the short-term seems to work for a majority of the clientele whom we have followed. A use protocol including inclusion criteria, positioning, parameters and data collection has been based on the available scientific literature. This document as well as the protocol on mirror therapy is at the disposal of clinicians and amputees having persistent phantom pain and who wish to obtain a supplementary way to manage their phantom pain. Please contact your health professional if you would like further information on mirror therapy.

5. Bibliography

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