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Mirror Therapy Rehabilitation in Low Back Pain Patients

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Mirror Therapy Rehabilitation in Low Back Pain Patients

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Abstract

Low back pain is a common occurrence experienced by many individuals. An estimated 75-85% of Americans experience some form of back pain during their lives [1]. While low back pain can be uncomfortable and debilitating, approximately 90% of cases are temporary and can resolved without surgery; however, 50% of patients will experience recurrent episodes of back pain. Low back pain that has persisted for more than twelve weeks is considered chronic low back pain [1]. Many researchers and therapists have been seeking the optimal treatment plans for individuals suffering from low back pain. Mirror therapy (MT) is a type of therapy that utilizes a mirror to help create a reflective illusion of an unaffected limb to trick the brain into movement without pain, it can also provide visual feedback of movement for the patient. MT has been shown to reduce pain and help with movement in patients recovering from a stroke or an amputation. There is ongoing research investigating the use of mirror therapy for patients with back pain and assessing whether this therapy can be advantageous for them. This review is focused on mirror therapy and how it can be utilized with patients who have low back pain. Peer-reviewed journal articles were sourced from databases such as PubMed, NIU Library Databases, and JOSPT. The findings indicate that mirror therapy may offer assistance with low back pain, although with limitations.

Background Information: Anatomical Contributors to Back Pain

Individuals affected by low back pain are often unaware of the underlying reasons or causes of their back pain. Back pain is not always due to an underlying disease; it could be caused or heightened by overuse, posture, aging, damage, or weak abdominal muscles. It is essential for health care providers to understand the anatomy of the spine and the back to better assess what treatments and exercises are best for each individual.
Disc herniation can lead to the development of sciatica and back pain. This occurs when the inner gel-like substance (nucleus pulposis) ruptures through the rigid outer portion (annulus fibrosis) of the interverbal disc (Fig. 1). Disc herniation can occur due to trauma to the area, aging, or overuse of the back [2]. The sciatic nerve (Fig. 2) is the largest nerve in the body and is often affected by disc herniation in the lumbosacral region (Fig. 3). Compression of the sciatic nerve from disc herniation causes sciatica, a feeling of numbness, tingling, or pain through the lower back and running down the back of the leg. Sciatica can also arise from hypertrophy of the piriformis muscle, trauma to the area, vertebral column stenosis, or muscle tightness [2].

The muscles commonly associated with back pain are the erector spinae, quadratus lumborum, and multifidus (Fig. 4). These muscles play crucial roles in vertebral stability and posture. When these muscles become weak, tight, or imbalanced, they can contribute to back pain. This is why it is recommended to have good posture, sit up straight, sleep with the correct mattress, and exercise the abdominal. Strengthening the core and back muscles by doing specific exercises such as lunges, bridge press, leg raises, bird dog pose, and planks can help reinforce those muscles [3].

Physical therapy can help strengthen these muscles and reinforce the vertebral column. Mirror therapy is an example of a technique that physical therapists may use to help patients experiencing back pain.
Figure 1. Model showing lumbar disc herniation

Figure 2. (A) Right sciatic nerve shown on cadaveric specimen. (B) Left sciatic nerve on plastinated specimen.
**Introduction**

Since the 1990s, low back pain has been increasing and is now the leading cause of global disability [4]. According to the World Health Organization, in 2020, 619 million people globally were affected by low back pain, and it is estimated that the number of cases will increase to 843 million by 2050 [5]. Low back pain can affect anyone and can range from acute to chronic. Most people will experience back pain at some point in their life, and in some cases, it is not related to illness or disability. Individuals with low
back pain are affected by limitations to their mobility, which can impact their activities of daily living (ADL). Therapists can use a variety of treatments for patients with low back pain and recently have been investigating how mirror therapy can help.

Vilayanur S. Ramachandran introduced MT as a technique to help patients with phantom limb syndrome by creating a reflection of the affected body part to trick the brain into perceiving movement without pain. MT consists of both unilateral and bilateral procedures. In unilateral procedures, actions are performed only on the unaffected limb. In contrast, bilateral procedures move the affected limb as much as possible to mimic the reflected movements of the unaffected limb.

MT not only provides benefits in clinical settings but can also be beneficial for home use. Thieme et al., states “One of the possible advantages of mirror therapy is the relatively easy administration and the possibility for self-administered home therapy for patients even with severe motor deficits”[6]. Many physical therapists will send patients home with specific exercises to do; the patients must know how to do them correctly for them to be effective. Using MT, especially in patients with back pain, ensures they can see themselves doing the exercises correctly. MT is more commonly used in stroke patients with affected limbs than in patients with back pain; however, there have been limited recent attempts at using mirror therapy for back pain. The purpose of this review is to provide insights into the effectiveness of mirror therapy as a treatment for back pain.

**Mirror Therapy in Low Back Pain Patients**

A study published in *The Clinical Journal of Pain* found that when patients with low back pain could visualize themselves doing the repeated movements, they reported significantly less pain and recovered faster within their rest periods. In this study, 25 patients performed different exercises under two different conditions. One condition stated that patients would stand between two mirrors that face each other and watch themselves do the specific exercises. In the other condition, the mirrors were covered while the patients performed their exercises. Every patient would record their pain level before and after performing their exercises, either with the mirrors or without. The study concluded that when patients were able to
see themselves do the exercises, they reported significantly less pain. The exact reason for the pain reduction is unknown, but the researchers believe it could be because the patients were less afraid to move their backs when they could watch themselves do the exercises correctly [7]. When comparing the results between patients who did not use the mirrors and the patients who did, results showed that the average pain reduction was only 1 point on the VAS score and only 50 seconds faster for recovery time [7]. More research is needed to investigate patients consistently engaged in mirror therapy multiple times daily and whether the potential benefits could become clinically significant.

Another study was conducted to assess the effectiveness of MT in pain management interventions and to find out how MT can help with particular pains. Back pain can be a symptom of an underlying condition and may be associated with various other issues in the body that contribute to the pain. Sometimes, physical therapists will work on other parts of the body to gain strength in the region of pain. Within this study, researchers analyzed how MT can be effective for any type of pain [8]. They emphasized that when patients see themselves doing certain exercises, it helps relieve anxiety, fear of movement, and other threats that the patient may think can increase the intensity of pain. Additionally, it was determined that MT can help correct disruptions of body image that can be associated with pain. This shows the possibility that reducing disturbances in body image might aid in reorganizing neural circuits in the brain towards a pre-existing state prior to the presence of the pain [8].

**Mirror Therapy for Improving Motor Functions**

Evaluating the success of MT on motor functions in different kinds of patients is crucial to understanding why and how it improves motor functions. A review completed by Thieme et al. assessed the used MT for improving function, motor impairment, activities of daily living, and pain in individuals recovering from a stroke. In total, 62 studies were included, collecting data from a total of 1982 participants. The review found moderate-quality evidence that mirror therapy has a significant positive effect on motor function [6]. Additionally, there was low-quality evidence that MT, at least as a complementary component to traditional post-stroke rehabilitation, can provide relief to individuals experiencing pain [6]. Considering
back pain is something that most people will experience at least once in their lifetime, it is essential to find the proper treatment to reduce the pain.

**Effectiveness Of Mirror Therapy on Pain**

Harrison et al. conducted a study using the Harrison’s mirror image. This approach reflects the patient’s head, ribs, and pelvis to help position weak areas and work on their posture. They selected 63 participants with chronic low back pain to receive the Harrison mirror image treatment. The participants all had experienced back pain for at least 3 months. Each participant would work on posture manipulations and other tractions (e.g., lateral and trunk). This was performed for about 3 minutes and increased to 1 minute per session until reaching 20 minutes. They also used berry translation traction (a lateral force providing a transverse load on the rib cage and spine to fix the pelvis position). Results found that there was not much change from pre- to post-treatment. However, they were able to conclude that low back pain in numerous individuals is linked to posture and the activity of trunk muscles, and awareness of the role of posture can lead to a decrease in back pain among individuals who recognize its importance [9].

**Case Study on Mirror Therapy Treatment**

In a case study by Iglar et al., a man was referred to physical therapy for his chronic back pain. He was educated on back pain, treated with supplemental MT, and assessed to see if MT was beneficial to his recovery. The subject was a 33-year-old male who had been living with chronic back pain for ten years and had undergone multiple surgeries [10]. He exhibited fear-driven avoidance behaviors, held uninformed beliefs about his back pain, and experienced impaired lateral recognition. The man was assessed with the recognise application that calculates the accuracy of identifying a back moving to the left or right side, as well as the speed at which each side is identified. The accuracy of 80% or above is considered normal; however, from the collected data, his scores fell below 80%. This helped the physical therapist understand that he could not distinguish between the left or right side of his back when trying to do specific exercises. Low back pain due to central sensitization was confirmed based on the patient's history, the cyclical pattern of pain, and the patient's misconception of pain [10].
He was instructed to watch videos of others picking things up with their back; he explained to the physical therapists how it 'made his back hurt' just from watching the videos. He was scared to damage his back more; from the previous surgeries he had gotten, he felt his back was very fragile. After using different treatments, they decided to try explicit motor imagery, which differs slightly from MT but uses a similar concept. MT uses a mirror that the patient looks at themselves, while explicit motor imagery is when the patient watches someone else do the exercise as they follow. Given the patient's fear of moving his back, it was essential for him to understand the significance of these movements and how others can assist in teaching them. After his treatment was implemented, the patient saw improvements in his pain and demonstrated positive thoughts about his back [10]. This case study aligns with the above-mentioned research, highlighting that patients who either observe themselves performing exercises or watch others and mimic their actions can experience significant improvements in their plan management.

**Summary of Findings**

Across studies on MT, including those not exclusively focused on back pain, there are consistent findings that visual feedback plays a role in helping patients undergoing rehabilitation achieve improvements in mobility and a reduction in pain.

After reviewing these selected peer-reviewed articles, there were some consistent findings among them. MT uses a mirror, allowing people to see themselves doing a specific movement. If there is an affected limb, the mirror will trigger the neurons in the brain to move that affected limb, just like the unaffected limb. While specific studies demonstrated the efficacy of mirror therapy in alleviating back pain, there were an insufficient number of studies that support mirror therapy as an optimal treatment for back pain. In the medical field, many associate mirror therapy with patients who have had a stroke, lost limbs, or have had some trauma to one side of their body.

Additionally, for clinicians, working on the back can be challenging because it constitutes an extensive area of the body, which makes it difficult to isolate and target a specific region for treatment. When
mirror therapy is utilized, patients do show improvement and like being able to see what their bodies are doing. Nevertheless, further research is essential in this field to determine whether mirror therapy is the optimal treatment choice for back pain or if there are more effective alternatives available. Future studies should further investigate other treatment options that can be used for back pain. This could include manual therapy, exercise, acupuncture, or even heat. In addition to this, future studies should focus on how long these sessions should last and how many times until effectiveness kicks in.

References