



Combined Effect Of Mirror Therapy And Mental Imagery On Phantom Limb Pain In Amputee Patient: A Case Study

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Abstract: The objective of this study is to determine how mirror treatment and mental imagery can help amputee patients with their phantom limb pain. Participants with PLP were chosen for the study. NPRS-11, MPQ, BDAI, and BPI were used to gather data before the intervention, and the same outcome measures were used to compare the outcomes after the intervention. The results indicate a small reduction in phantom limb discomfort. The study we conducted led us to the conclusion that mirror therapy combined with mental imagery may slightly alleviate phantom limb discomfort in patients with above-knee amputations.

Index Terms – Phantom limb pain, Mirror therapy, Mental imagery, Amputation.

I. INTRODUCTION

Phantom limb pain (PLP) is a distressing condition frequently experienced by amputees, characterized by painful sensations perceived in the absent limb. Phantom limb pain is a crippling ailment that is typified by an unpleasant feeling in the area of the amputated limb that is missing. Phantom limb pain (PLP) is the term used to describe pain felt in a limb, organ, or other tissue following removal or amputation. Patients who experience phantom pain frequently describe it as a burning, stinging, agonizing, or piercing sensation. The phantom sensation, on the other hand, is the non-painful experience of a lost body part following amputation or surgical removal. The term "pain at the site of an extremity amputation" refers to discomfort in the residual limb. It should come as no surprise that the early post-amputation phase is when residual limb pain is most prevalent. Even after the post-surgery healing phase, pain in the residual limb may continue. According to several reports of acute post-operative discomfort, chronic pain in the residual limb has been described as "burning," "shocking," or "stabbing" and is said to arise at the scar at the lower end of the stump.

A process known as "telescoping" takes place in around one-third of amputees, in which the phantom continues to progressively reach the residual limb. Over time, the distal portion of the phantom could attach itself to the residual limb or even be felt inside it. According to Cronholm, the phantom never grows longer than the pre-amputation limb, even though it may shorten or telescope. In some situations, such as when the amputee uses a prosthesis, a telescoped phantom often expands to the length and volume of the pre-amputation limb. Additionally, some evidence suggests that a telescoped phantom limb only feels phantom sensation, and that during a period of phantom pain, the phantom spreads over the stump to take on normal aspects. There is disagreement on the prevalence of phantom limb pain in the amputee group, in contrast to the literature on phantom sensation. According to a large body of research, phantom limb discomfort is uncommon. But according to several other studies, 60–80% of amputees suffer from phantom limb discomfort.

The fact that prevalence figures for phantom limb pain have been based on studies where the patient's desire for treatment is the only way to determine their level of discomfort has contributed to this disagreement. The prevalence of phantom limb pain is seen to be minimal when these numbers are contrasted with those obtained from amputees who choose not to seek medical attention for their discomfort. According to recent research, a sizable portion of amputees (54–85%) who do not seek pain therapy also report having severe phantom limb discomfort. According to the recent studies, the primary causes of amputations are rapidly shifting from trauma and vascular insufficiency to diabetes consequences. Diabetes mellitus and its consequences accounted for 11 (29.7%) of the amputations in the current study, making them the leading cause of amputations. Following it were nine patients (24.3%) with trauma, six patients (16.2%) with peripheral arterial disease, five patients (13.5%) with necrotizing fasciitis or necrotizing soft tissue infection (NSTI), four patients (10.8%) with chronic osteomyelitis, and a single patient each with melanoma of the foot and squamous cell carcinoma of the skin forefoot.

Assessment of the level of amputation should take into account the:

- severity and pattern of vascular disease
- degree of tissue loss
- viability of tissues in the vicinity of the proposed flap

The most frequent amputation done on a lower limb is at the toe. Prior to surgery, the arterial circulation has to be assessed. A 98% healing rate is linked to the existence of palpable foot pulses; in the absence of them, the rate drops to 75%. Fishmouth or circular incisions can be used for toe amputation. Toe amputation is often done through the proximal phalanx; amputation cannot be done through a joint as this exposes avascular cartilage that is not going to recover. Among the most widely prescribed drugs for a variety of neuropathic symptoms, including PLP, are tricyclic antidepressants. Tricyclic antidepressant analgesia is mostly ascribed to the inhibition of sodium channel blockage, NMDA receptor antagonism, and serotonin-norepinephrine uptake blockade. There is conflicting evidence on the effects of tricyclic antidepressants on PLP, despite their well-established significance in other neuropathic pain syndromes. It has been discovered that transcutaneous electrical nerve stimulation helps with PLP. Numerous studies have demonstrated in the past that TENS applied to the contralateral limb is more effective than that applied to the ipsilateral in reducing PLP. Low-frequency, high-intensity TENS is believed to be more beneficial than other dosages, despite the lack of solid proof. TENS equipment has minimal adverse effects or contraindications, is portable, and is simple to use.

By treating the brain's visual-proprioceptive dissociation, mirror treatment—first outlined by Ramachandran and Rogers-Ramachandran in 1996—is meant to help PLP. As they view the reflection of their intact limb moving in a mirror placed parasagittally between their arms or legs, the patient simultaneously moves the phantom hand or foot in a manner similar to what they are witnessing, leading the virtual limb to replace the phantom limb. Studies have shown that mirror neurons in the brain fire when an animal sees or performs an action. There is no concrete evidence to link particular PLP types with particular biofeedback approaches, despite previous findings indicating that temperature biofeedback may be beneficial for PLP burning sensations. A case study using visual feedback that helps lessen phantom pain is also available. Guided imagery, relaxation techniques, and hypnosis have all been used to treat a variety of neuropathic pains; they may also be useful for PLP. Acupuncture has been shown to help PLP in certain case reports. Numerous case studies have documented the efficacy of cognitive behavioral therapy in treating neuropathic pain disorders. Humans have also been shown to have similar homologous neurons. The existence of mirror neurons in the brain is further supported by the tactile sensation in the phantom limb, which is elicited by touching the virtual image of the limb in the mirror.

Usually, surgery is used when all other forms of therapy have failed. A case study examines the effect of dorsal root entry zone (DREZ) lesioning on upper limb phantom pain caused by brachial plexus avulsions. Another case study demonstrated that spinal cord stimulation was successful for a subset of individuals who had not had sufficient relief from medical treatment. Case reports of PLP improvement after deep brain stimulation of the periventricular gray matter and thalamic nuclei have been documented. Additionally, motor cortex stimulation was found to be helpful in a PLP case. Local problems unique to amputation surgery include infection, flap necrosis, and stump hemorrhage. Fall-related stump trauma is frequent, frequently brought on by forgetting that a limb is missing. The Pain Management Team will assist with phantom pain and postoperative wound pain. As a first-line pharmaceutical treatment, amitriptyline and gabapentin can frequently be used to effectively treat the latter. Following amputation, psychological issues and depression

are typical as part of the emotional adjustment to losing a limb. The development of neuromas, osteomyelitis, bone erosion, ulceration, and persistent ischemia are examples of late consequences.

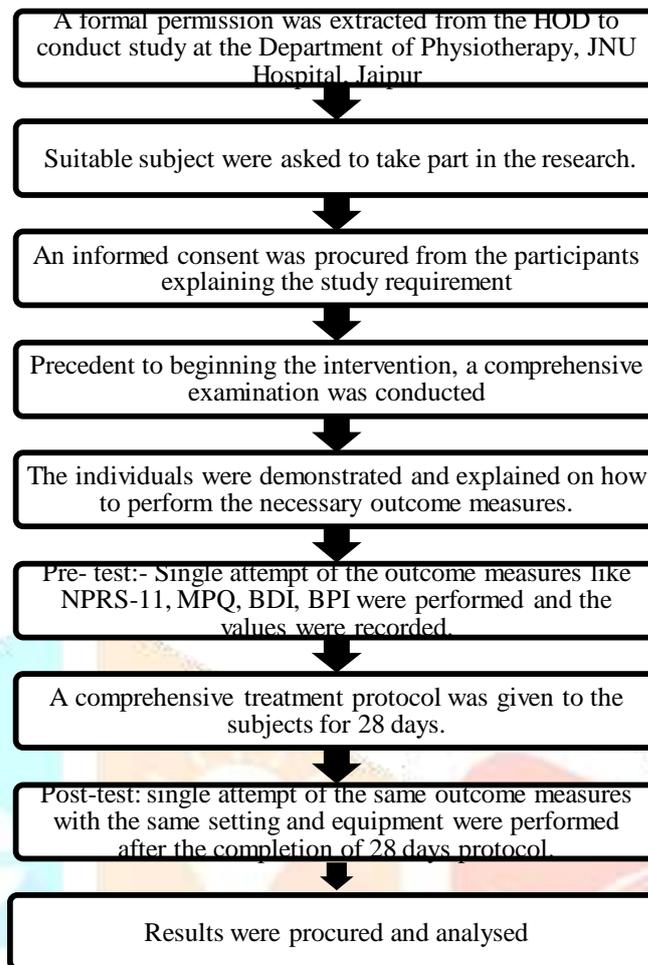
Recent studies showed that compared to individuals without PLP, those with PLP had a twofold higher likelihood of having had chronic pre-amputation discomfort. Studies conducted elsewhere have shown that people with PLP are three to ten times more likely to have had chronic pre-amputation pain. Through a physiological process known as central sensitization, persistent pain before to amputation increases the central nervous system's hyperexcitability, which may thereafter continue to increase nociceptive activity following amputation, resulting in PLP with comparable features. This might explain why pre-amputation pain and PLP are strongly correlated.

Jensen et al. first postulated this causal mechanical connection between PLP and pre-amputation pain following the discovery of significant similarities between PLP and the kind, intensity, and quality of pre-amputation pain. Other research has now confirmed this theory, demonstrating that PLP with comparable features occurs in more than 60% of patients who had chronic pre-amputation pain. The necessity of optimizing perioperative pain treatment with multimodal analgesia is further highlighted by the substantial correlation between pre-amputation pain and PLP, especially in patients who may have had pre-amputation pain and had uncontrolled diabetes and limb infection. According to research, those with PLP were more likely to have had non-painful phantom limb sensations than those without pain. According to previous studies, 70–100% of amputees who had non-painful phantom experiences also reported PLP. This co-occurrence suggests that the brain processes behind PLP and non-painful emotions are comparable. Premotor and somatosensory cortices opposing the severed limb are activated when PLP and non-painful phantom emotions are evoked, according to research. Given the similarities in brain activity patterns, PLP and non-painful phantom experiences could be related.

II. CLINICAL SIGNIFICANCE

Phantom limb pain is affecting millions of amputees and impacting their quality of life. While existing treatments are effective for short period of time in amputees, there remains a significant need for alternative treatments approaches. Research indicates that non-pharmacological treatments like mental imagery and mirror therapy may improve the effectiveness of treatment. The purpose of this study is to assess how mirror treatment and mental imagery work together to improve PLP in amputees. In summary, the proposed research holds significant relevance in advancing our understanding of PLP treatment and may inform future clinical practices by integrating mirror therapy alongside mental imagery.

III. RESEARCH METHODOLOGY



IV. STUDY DESIGN

This case study utilized a qualitative single-case experimental design to investigate the combined effect of mirror therapy and mental imagery on phantom limb pain (PLP) in an amputee patient.

V. SAMPLE SIZE

A convenience sample of one participant with unilateral transtibial amputee experiencing persistent PLP for over six months was purposively selected from a Jaipur outpatient physiotherapy clinic, ensuring alignment with inclusion criteria such as no recent prosthetic adjustments and stable comorbidities.

VI. TOOLS

Assessment Form, which consisted of demographic data, chief complaints, personal history, medical history, occupational history, and history of present illness, height, weight, and BMI values for every individual. Data Collection Form is an evaluation form, which consists of questionnaires pre-test and post-test data for the relevant outcome measures Brief Pain Inventory, Visual Analogue scale, McGill Pain Questionnaire, Beck's Depression Inventory. Data was collected before and after 28 days intervention of Mirror therapy and Mental imagery.

VII. THEORETICAL FRAMEWORK

Variables of the study contains dependent and independent variable. The study used pre-specified method for the selection of variables.

1.1 Dependent Variables

- a. Brief Pain Inventory (BPI)
- b. Visual Analogue Scale (VAS)
- c. Beck's Depression Inventory (BDI)
- d. McGill Pain Questionnaire (MPQ)

1.2 Independent Variables

- a) Mirror Therapy
- b) Mental Imagery

VIII. OUTCOME MEASURE

a) Brief Pain Inventory (BPI): The Brief Pain Inventory - Short Form (BPI-sf) is a 9 item self-administered questionnaire used to evaluate the severity of a patient's pain and the impact of this pain on the patient's daily functioning. The patient is asked to rate their worst, least, average, and current pain intensity, list current treatments and their perceived effectiveness, and rate the degree that pain interferes with general activity, mood, walking ability, normal work, relations with other persons, sleep, and enjoyment of life on a 10point scale. The BPI-sf is a modification of the Brief Pain Inventory - Long Form, which includes additional questions on demographics (date of birth, marital status, education, employment), pain history, aggravating and easing factors, treatment and medication, pain quality, and response to treatment.

b) Numerical Pain Rating Scale-11: The Numerical Rating Scale (NPRS-11) is an 11-point scale, ranging from '0' for no pain, to '10' for the worst pain imaginable. It is for self-report of pain. It is the most commonly used unidimensional pain scale. The respondent selects a whole number (integers 0–10) that best reflects the intensity (or other quality if requested of his/her pain. The anchors are 0 = no pain and 10 = extreme pain/worst possible pain (there are various different wordings of the upper anchor). It is often categorized into: no pain = 0, mild pain = 1-3, moderate pain = 4-6, severe pain = 7-10, but these categories do not necessarily reflect patient meanings, and are poor for any assessment of change. The categories might be used to set targets for intervention outcome. The NPRS can be administered verbally (therefore also by telephone) or graphically for self-completion.

c) McGill Pain Questionnaire: The McGill Pain Questionnaire (MPQ) is a self-reporting measure of pain used for patients with a number of diagnoses. It assesses both quality and intensity of subjective pain. The MPQ is a multi-dimensional tool for pain assessment and it has three components, which are the sensory intensity, the cognitive evaluation of pain and the emotional impact of pain. The MPQ is composed of 78 words. Seven words are selected from the following categories: dimension 1 to 10 (pain descriptors), three words; dimensions 11 to 15 (affective components of pain), dimension 16 (evaluation of pain) one word, and dimension 17 to 20 (miscellaneous) one word. Scores are tabulated by summing values associated with each word; scores range from 0 (no pain) to 78 (severe pain)

d) Beck's Depression Inventory: The Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) is the most well-researched depression self-report inventory with older adults. It is a 21-item, multiple-choice inventory employing Guttman scaling designed to assess the level of depression in adults. Each item is scored 0 to 3 points for a total score range of 0 to 63. The scale was developed as a quantitative measure of depression and was not originally intended as a diagnostic instrument. Score ranges for mild depression, moderate to severe depression, and severe depression are 10–19, 20–30, and 31 or higher, respectively. A 13-item short form is also available with score ranges of 5–7 for mild depression, 8–15 for moderate depression, and 16 or higher for severe depression. The full-scale BDI requires approximately 5–10 minutes to administer, whereas the short form requires approximately 5 minutes.

IX. CASE DESCRIPTION

On 19th May 2023, at approximately 10:30 PM, the patient, employed as a taxi driver, was involved in a high-impact motor vehicle accident near the Army Base area in Jodhpur. Following the incident, the patient was promptly transported to Mathura Das Mathur Hospital, Jodhpur, where he received emergency medical management. Clinical Findings on Admission included extensive soft tissue damage and open fractures in both lower limbs, Severe vascular compromise with absent distal pulses bilaterally, Signs of compartment syndrome and developing tissue necrosis, Active hemorrhage, managed during initial resuscitation, Neurovascular deficits below the level of injury sites. Radiographic imaging revealed comminuted fractures involving the tibia and fibula bilaterally. Laboratory investigations indicated anemia (due to blood loss) and elevated inflammatory markers, suggestive of a systemic inflammatory response. No associated head injury, chest trauma, or intra-abdominal injuries were identified. Immediate hemodynamic stabilization with intravenous fluids and blood transfusions. Wound debridement and application of external fixation devices to stabilize fractures. Administration of broad-spectrum intravenous antibiotics to prevent infection. Continuous monitoring for signs of systemic infection or sepsis. Surgical Intervention initiated After 12 days of observation and management, the patient's lower limb injuries showed no signs of recovery, and progressive tissue necrosis was noted. The patient was referred to Sawai Man Singh (SMS) Hospital, Jaipur for specialized care. Following further evaluation at SMS Hospital, given the extent of vascular damage, infection risk, and

non-viability of tissues, a decision for surgical amputation was made. The procedure was successfully performed on 31st May 2023. Post-operative Care includes post-amputation wound care and infection prevention protocols were initiated. Pain management, including the use of analgesics and neuropathic pain medications. Early psychological counseling provided to address emotional trauma and adaptation to limb loss. Initiation of physiotherapy and planning for prosthetic rehabilitation. Signs of Phantom Limb Pain were noted, characterized by Sensations of burning, tingling, or electric-shock-like pain in the absent limb. Perception of the missing limb's presence, often in a distorted or painful position. Exacerbation of pain episodes during periods of stress or at night. Hypersensitivity around the amputation stump area. Management of Phantom Limb Pain Pharmacological management included use of gabapentinoids and antidepressants. Patient education and counseling sessions were conducted to reduce anxiety associated with phantom sensations.

X. PROCEDURE

A single-subject case study design was employed to investigate the effects of Mirror Therapy and Mental Imagery on phantom limb pain (PLP) following a above-knee amputation (AKA). The participant was selected based on the basis of History of unilateral above-knee amputation (minimum 2 years post- surgery), having no history of major psychiatric illness or unmanaged neuropathic conditions. Mirror Therapy intervention held for 30 minutes and Mental Imagery Administered immediately following mirror therapy, lasting approximately 20 minutes. The readings of NPRS-11, Brief Pain Inventory, Beck's Depression and Anxiety Inventories, McGill Pain Questionnaire was recorded before and after the intervention. The intervention combined Mirror Therapy and Mental Imagery techniques, administered over a period of 4 weeks, with 5 sessions per week. Mirror Therapy Protocol proceeds with a mirror (minimum size: 90×60 cm) placed in the midsagittal plane. The participant was seated comfortably with the intact limb placed in front of the mirror and the residual limb positioned behind it, hidden from view. Participant viewed the reflection of the intact limb while performing bilateral symmetrical movements ankle dorsiflexion/plantarflexion, toe movements, knee flexion/extension, abduction/adduction. Focus was directed toward visualizing the reflection as the missing limb moving naturally. Mental Imagery Protocol proceeds with Guided motor imagery focusing on the missing limb. Visualization of moving the phantom foot and ankle, such as pointing toes, tapping the floor, or walking. Emphasis on both visual imagery (seeing the movement) and kinesthetic imagery (feeling the movement).

XI. ASSESSMENT

Before initiating the intervention, a comprehensive baseline assessment was conducted to establish the participant's pre-intervention status.

a. Numerical pain rating scale (NPRS)

NPRS is clinical assessment tool used to evaluate pain intensity that provides a simple, quick, and reliable assessment of pain in adults. The respondent chooses a whole number (integers 0–10) that most accurately represents the degree of pain (or another attribute, if asked) that they are experiencing. The upper anchor has many wordings, with 0 denoting no discomfort and 10 denoting acute agony or the worst conceivable pain. It is frequently divided into the following categories: no pain = 0, mild pain = 1–3, moderate pain = 4–6, and severe pain = 7–10. However, these classifications are inadequate for any evaluation of change and may not always represent patient meanings.

b. Brief pain inventory (BPI)

The Brief Pain Inventory - Short Form (BPI-sf) is a 9 item self-administered questionnaire used to evaluate the severity of a patient's pain and the impact of this pain on the patient's daily functioning. The patient is asked to rate their worst, least, average, and current pain intensity where 0 is no pain and 10 as bad as you can imagine. There is two sections:

• Pain severity

In the past 24 hours, when was your discomfort at its worst?

In the past 24 hours, what pain did you experience the most?

On average, how much pain did you experience?

What was causing you discomfort at the moment?

How are you managing your pain? Are you using any medications?

How much relief in pain you have felt after having treatment or medicines?

- Pain interference

How much pain interfere with your general activity?

How much pain interfere with your mood?

How much pain interfere with your walking ability?

How much pain interfere with your normal work?

How much pain interfere with your sleep?

How much pain interfere while building relations with other?

How much pain interfere while having fun?

c. McGill Pain Questionnaire (MPQ)

The MPQ is a multi-dimensional tool for pain assessment and it has three components, which are the sensory intensity, the cognitive evaluation of pain and the emotional impact of pain. The MPQ is composed of 78 words. Seven words are selected from the following categories:

dimension 1 to 10 (pain descriptors), three words.

dimensions 11 to 15 (affective components of pain).

dimension 16 (evaluation of pain) one word.

dimension 17 to 20 (miscellaneous) one word.

Scores are tabulated by summing values associated with each word; scores range from 0 (no pain) to 78 (severe pain). This questionnaire helps to understand pain better – how it feels, how strong it is, how it affects you.

d. Beck's depression inventory (BDI)

It is a 21-item, multiple-choice inventory employing Guttman scaling designed to assess the level of depression in adults. Each item is scored 0 to 3 points for a total score range of 0 to 63.

1-10: Ups and down considered normal

11-16: Mild mood disturbance

17-20: Borderline clinical depression

21-30: Moderate depression

31-40: Severe depression

Over 40: Extreme depression

XII. INTERVENTION

Sr No.	Physiotherapy Protocol	Frequency	Intensity	Time	Type
1.	Mirror therapy	10 reps x 5 sec hold	5 sets	30 minutes each session.	i. Dorsiflexion and plantarflexion ii. Inversion and eversion iii. Circular ankle motion iv. Toe movements v. Stimulated walking movements
2.	Mental imagery	10 reps x 5 sec hold	5 sets	20 minutes each session.	I. Relaxation exercise II. Imagining specific movements <ul style="list-style-type: none"> ➤ Dorsiflexion and plantarflexion ➤ Inversion and eversion ➤ Circular ankle movements III. Normal function visualization <ul style="list-style-type: none"> ➤ Walking ➤ Jogging

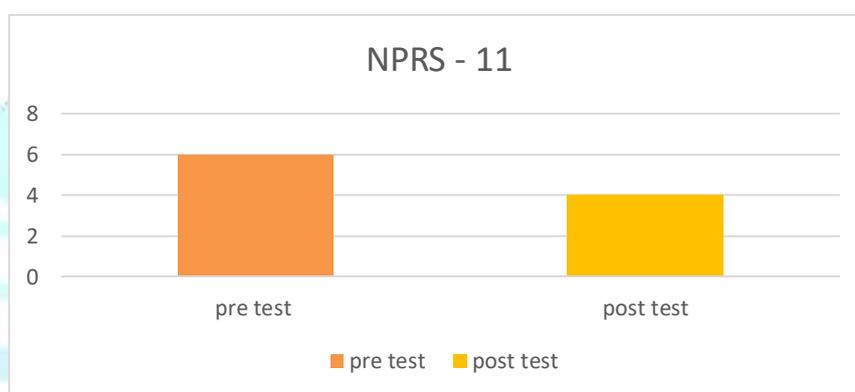
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XIII. RESULTS AND DISCUSSION

1. Numerical Pain Rating Scale- 11 (NPRS-11):

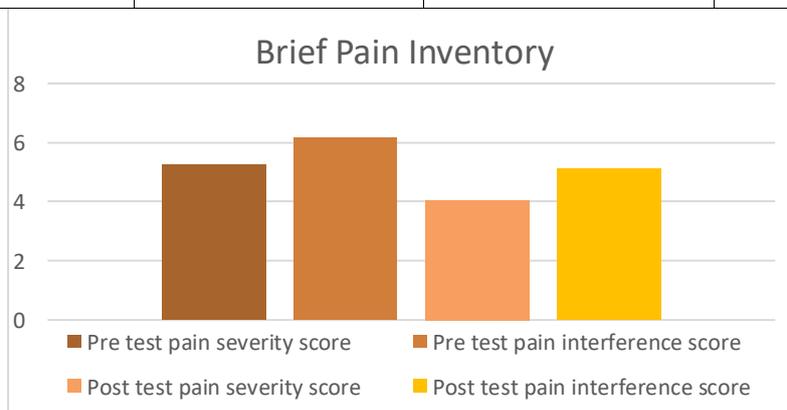
NPRS-11 was employed to gauge the degree of pain, and the results of the pre-test and post-test were 6 and 4, respectively.

Pre Test Score	Post Test Score
6	4



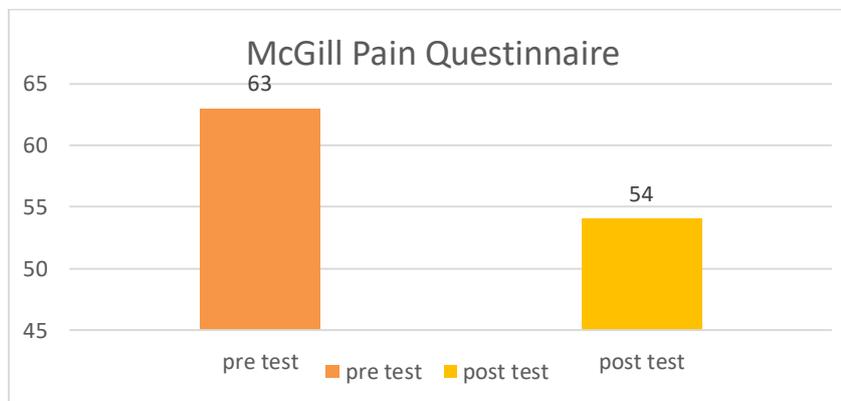
2. Brief Pain Inventory (BPI): The Brief Pain Inventory is a standardized questionnaire used to assess both pain intensity and pain interference with function. Its pre test findings for pain severity and pain interference were 5.25 and 6.14 and post test findings were 4.05 and 5.1 respectively.

Pre Test		Post Test	
Pain Severity score	Pain interference score	Pain Severity score	Pain interference score
5.25	6.14	4.05	5.1



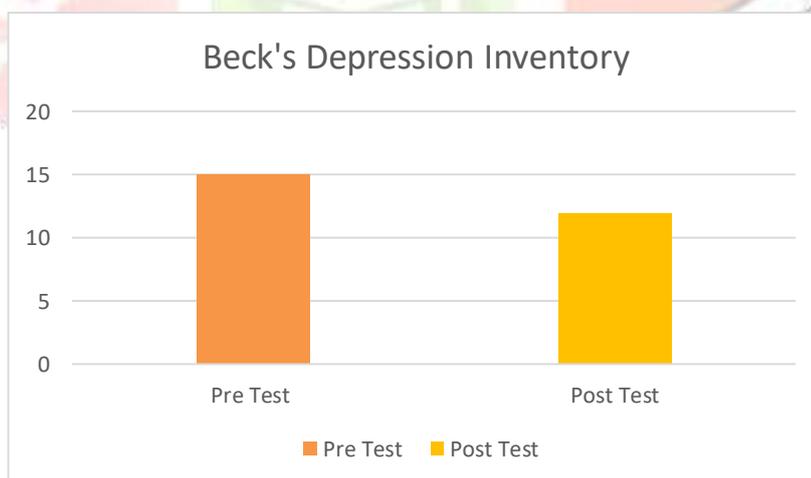
3. **McGill Pain Questionnaire (MPQ):** MPQ is used to assess the quality and intensity of a pain. It evaluates multiple aspects of pain, including sensory qualities, affective qualities, evaluative dimension, temporal aspects. Its pre test and post test findings are 63 and 54 respectively.

Pre Test Score	Post Test Score
63	54



4. **Beck's Depression Inventory (BDI):** BDI is used to assess the severity of depression and anxiety. Its Pre test and post test findings are 15 and 12 respectively.

Pre Test Score	Post Test Score
15	12



The purpose of this study was to evaluate the effects of mental imagery and mirror treatment on phantom limb pain in patients who had above-knee amputations. The absence of evidence for combined mental imagery and mirror therapy in the literature opened up new possibilities for the prevention and treatment of phantom limb pain, respectively. However, research has shown that non-invasive mental imagery and mirror treatment have different impacts on ailments like phantom limb pain.

PLP is a complex neuropathic condition that causes pain in the amputated limb. Traditional approaches to managing PLP have included pharmacological treatment, physical therapy, and other non-invasive neuromodulation techniques. However, because of their non-invasiveness and beneficial effects, cortical-based therapies like mental imagery and mirror therapy have gained popularity in recent years.

The study's findings showed that patients who received a combination protocol of mental imagery and mirror treatment saw a statistically marginal decrease in PLP frequency and intensity. These results are in line with other studies that demonstrate the efficacy of both therapies on their own. Nonetheless, it seems that the combined application produces more advantages, indicating a synergistic impact. In order to assist restructure cortical representations and lessen the experience of pain, mirror treatment creates visual input that "tricks" the brain into believing the missing limb is present and moving. According to Brunelli et al. (2019), every patient in the study population showed a significant decrease over time in the mental imagery group. Between-group studies showed a significant reduction in average and worst pain intensity as well as interference with activities at the time of the follow-up evaluation. Additionally, 13 individuals with upper limb amputation demonstrated a reduction in PLP intensity during hand and lip movement after undergoing intense 6-week mental imagery training, according to MacIver et al. 2023.

However, by imagining movement and sensory experiences, mental imagery stimulates cortical activation, which may improve neuronal plasticity and repair damaged sensorimotor integration. The visual, motor, and somatosensory cortices are among the neural networks that are probably activated when both treatments are combined. More efficient brain remodeling and desensitization of pain pathways may result from this multimodal stimulation. Furthermore, the patient's involvement and concentration during the visual feedback sessions may be improved by using mental imagery as a prelude or priming technique for mirror treatment.

Ramadugu et al. (2013) found that the mirror treatment group's PLP was considerably lower than the control group's at 4 weeks ($P < .0001$) in a randomized single crossover trial including 64 amputees. The control group similarly showed a notable decline after the switchover. For 12 weeks, the decline was sustained by both groups, and no adverse consequences were seen. In a similar vein, our investigation demonstrated that PLP considerably improved in both groups; however, crossover was not carried out due to the extended follow-up durations.

Ramachandran & Rogers-Ramachandran 2022, Chan et al. 2007, Mirror treatment alone has been proven to reduce PLP in another research. Likewise, Moseley, 2004 have shown that mental imagery can help with pain management and motor control. Few research, nonetheless, have looked at how these therapies work together. This study contributes to the corpus of studies showing that using these two modalities together produces greater outcomes than using them alone.

XIV. CONCLUSION

By the virtue of this study's statistical analysis and results, it is concluded, above evidence suggests that Mirror therapy and Mental imagery for PLP has slight effect on NPRS-11, Brief pain inventory (BPI), Beck's depression inventory & McGill pain questionnaire in individuals with Above knee amputation.

XV. LIMITATIONS OF STUDY

There were few limitations to the current study:

- The study has been concluded on small sample size.
- This study is not extended more than 4 weeks for a patient due to time constraint.
- Patient participation and adherence to subjective mental imagery exercises may differ, which may affect outcome.

XVI. ACKNOWLEDGEMENT

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