

Original Research Article

## Effectiveness of Mirror Therapy in Reducing Phantom Limb Pain

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### ABSTRACT

**Introduction:** Amputation is the removal of part or all of a body part that is enclosed by skin. Most of individuals suffer from phantom limb pain in the region of their absent limb may be described as burning, cramping, stabbing in nature. Mirror therapy is the most promising method of treatment of phantom limb pain.

**Aim:** To assess the effectiveness of mirror therapy on reducing phantom limb pain among amputated patients in selected hospitals of Punjab.

**Materials & methods:** A quasi experimental (two group pre test post test) research design was chosen for the study. Convenient sampling technique with random assignment was used to select 60 amputated patients having phantom limb pain. The subjects in experimental group (n=30) were provided mirror therapy and conventional therapy and in control group (n=30) only conventional therapy was provided. Numeric Pain Rating Scale (0-10) and Socio demographic performa was used to collect the data.

**Results:** Phantom limb pain among amputated patients after 1 week of mirror therapy (p value was 0.013) and after 2 weeks of mirror therapy (p value was 0.000) at p value <0.05 in experimental group as compared to control group. There was significant difference in phantom limb pain after 1 and 2 week of mirror therapy in experimental and control group.

**Conclusion:** The study concluded that mirror therapy was effective in reducing phantom limb pain after 2 weeks (twice for 10 minutes) of intervention in experimental group.

**Keywords:** Phantom limb pain, amputated patients, mirror therapy, Numeric pain rating scale.

### INTRODUCTION

There are approximately 2 million people living with limb loss in United States. Among those living with limb loss, the main causes for amputation are vascular disease (54%) including diabetes and peripheral arterial disease; trauma (45%) and cancer (less than 2%).<sup>[1]</sup>

The most common reason for amputation is a loss of blood supply to the affected limb (critical ischaemia), which accounts for 70% of lower limb amputations. Lower extremity ulcers and

amputations are an increasing problem among individuals with diabetes.<sup>[2]</sup>

Subsequent to amputation, most of individuals suffer from phantom limb pain (PLP) in the region of their absent limb. The pain may be experienced intermittently or constantly, and may be described as crushing, cramping, stabbing or throbbing, among other descriptors.<sup>[3]</sup>

The oldest proposed mechanism for phantom limbs states that neuromas continue to generate impulses to the spinal cord and the brain as if the limb were still

attached and causes pain. [4] Melzack proposed a theory according to which impulses of phantom sensations are initiated in neuromatrix. The impulses arise from an area in the brain, as opposed to the spinal cord. [4] Some researchers proposed that changes occur not only in the peripheral nervous system and spinal cord but also in the cerebral cortex. It is hypothesized that amputees retain neural activity and function of the thalamic representation of the amputated limb. [5] The cortical reorganization explains that afferent nociceptive stimulation of neurons within the stump or surrounding areas can produce sensations in the missing limb. [6-8]

The first report of mirror therapy for phantom pain was described by Ramachandran and colleagues in 1995. [9] The mirror image of the normal body part helps reorganize and integrate the mismatch between proprioception and visual feedback of the removed body. Thus, enhancing the treatment effect for phantom limb pain. The clinical effect of mirror therapy is much more significant than any other treatments. [10,11]

## **MATERIALS AND METHODS**

A quasi-experimental study with quantitative approach was done to assess the effectiveness of Mirror therapy on reducing phantom limb pain among amputated patients. The present study was conducted at orthopaedic wards of Amandeep Hospital; Hargun Hospital and Hardas Hospital, Amritsar. The sample for the study was 60 amputated patients having phantom limb pain and convenient sampling technique with random assignment was used to select the sample. The patients who had impaired cognitive abilities, bilateral upper and lower extremity amputation were excluded from the study. After the selection of study subjects, identification profile of the patients was filled in the record performa. Two tools were used to collect data from the subjects.

### **Tool No. 1 Socio -Demographic Profile**

The socio-demographic Profile of the patient was prepared by the investigator under the guidance of guide and co- guide. It includes many variables such as age, gender, cause of amputation, site of amputation, type of anaesthesia, presence of pre amputation pain, any previous history of amputation, any previous experience of phantom limb pain, presence of any other disease, presence of any other chronic pain and any history of addiction.

### **Tool No. 2 Numeric Pain Rating Scale**

In this section, Numeric Rating Scale is used to assess the level of pain. The Numeric Pain Rating Scale (NPRS-11) is an 11–point scale for patient self-reporting of pain level.

Try out of the tools and intervention was done to ensure the reliability and understanding of the tool. Pilot study was conducted in orthopaedic ward of Guru Gobind Singh Medical Hospital, Faridkot to find feasibility of the study and was found to be feasible. After assessing the pre-test pain, intervention of mirror therapy was given twice (morning and evening) daily for 10 minutes till 2 weeks to the experimental group. Plane mirror of size 34×21 inches was used in the study. Post assessment of the phantom limb pain was done after 1 week and 2 week of intervention.

**Ethical Consideration:** This study has been approved by the Ethical committee of University College of Nursing, BFUHS (Baba Farid University of Health Sciences). Permission was taken from the Amandeep, Hargun and Hardas Hospitals, Amritsar. Written informed consent was taken from each study subject after informing them about study and its objectives. Freedom was provided to the participants for quitting in between of the study. Confidentiality & privacy of the study subjects was maintained throughout the study.

**Statistical analysis:** Statistical analysis was done by using SPSS (20) software.

The descriptive statistics (percentage, mean, standard deviation) and inferential statistics (independent t test, chi square, ANOVA test) was used for statistical analysis. The t-test and ANOVA

were used to assess the effectiveness of Mirror therapy on reducing phantom limb pain. The p value at <0.05 was considered statistically significant.

## RESULTS

**Table No: 1(a) Distribution of study subjects according to socio demographic variables N=60**

S. No	Sample Characteristics	Experimental group n=(30)		Control group n=(30)		Total subjects n=(60)		$\chi^2/p$ value	Df
		N	Percentage (%)	n	Percentage (%)	n	Percentage (%)		
<b>I</b>	<b>Age in years</b>							3.40/ 0.493 <sup>NS</sup>	4
	16-25	04	13.33	01	3.33	05	8.33		
	26-35	04	13.33	06	20.00	10	16.67		
	36-45	06	20.00	08	26.67	14	23.33		
	46-55	08	26.67	10	33.33	18	30.00		
≥56	08	26.67	05	16.67	13	21.67			
<b>II</b>	<b>Gender</b>							3.06/ 0.143 <sup>NS</sup>	1
	Male	19	63.33	25	83.33	44	73.33		
	Female	11	36.67	05	16.67	16	26.67		
<b>III</b>	<b>Cause of amputation</b>							3.02/ 0.388 <sup>NS</sup>	3
	Crush injury	23	76.67	24	80.00	47	78.33		
	Diabetes neuropathy	06	20.00	03	10.00	09	15.00		
	Tumor	00	0.00	02	6.67	02	3.33		
	Burn	01	3.33	01	3.33	02	3.33		
<b>IV</b>	<b>Site of amputation</b>							1.06/ 0.785 <sup>NS</sup>	3
	Above Knee Amputation	04	13.33	06	20.00	10	16.67		
	Below Knee Amputation	18	60.00	18	60.00	36	60.00		
	Above Elbow Amputation	04	13.33	02	6.67	06	10.00		
	Below Elbow Amputation	04	13.33	04	13.33	08	13.33		
<b>V</b>	<b>Side of amputation</b>							0.26/ 0.605 <sup>NS</sup>	1
	1. Right	17	56.67	15	50.00	32	53.33		
	2. Left	13	43.33	15	50.00	28	46.67		
<b>VI</b>	<b>Type of Anaesthesia</b>							1.05/ 0.591 <sup>NS</sup>	2
	1. General Anaesthesia	26	86.67	23	76.67	49	81.67		
	2. Spinal Anaesthesia	02	6.66	04	13.33	06	10.00		
	3. Regional Anaesthesia	02	6.66	03	10.00	05	8.33		
<b>VII</b>	<b>Pre amputation pain</b>							0.57/ 0.448 <sup>NS</sup>	1
	No	05	16.67	03	10.00	08	13.33		
	Yes	25	83.33	27	90.00	52	86.67		

<sup>NS</sup> Non-significant at p<0.05

**Table No: 1(b) Distribution of study subjects according to socio demographic variables N=60**

S. No	Sample Characteristics	Experimental group n=(30)		Control group n=(30)		Total subjects n=(60)		$\chi^2/p$ value	df
		N	Percentage (%)	n	Percentage (%)	n	Percentage (%)		
<b>VIII</b>	<b>Previous history of amputation</b>							2.06/ 0.150 <sup>NS</sup>	1
	1. No	28	93.33	30	100.00	58	96.67		
	2. Yes	02	6.67	00	0.00	02	3.33		
<b>IX</b>	<b>Previous experience of Phantom Limb Pain</b>								
	No	30	100.00	30	100.00	60	100.00		
	Yes	00	0.00	00	0.00	00	0.00		
<b>X</b>	<b>Any other disease</b>							3.29/ 0.192 <sup>NS</sup>	2
	No	25	83.33	29	96.67	54	90.00		
	Diabetes mellitus	03	10.00	01	3.33	04	6.67		
	Rheumatoid Arthritis	02	6.67	00	0.00	02	3.33		
<b>XI</b>	<b>Any Chronic Pain</b>							2.06/ 0.150 <sup>NS</sup>	1
	1. No	28	93.30	30	100.00	58	96.67		
	2. Yes	02	6.67	00	0.00	02	3.33		
<b>XII</b>	<b>History of Addiction</b>							1.14/ 0.565 <sup>NS</sup>	2
	1. No	26	86.67	26	86.67	52	86.67		
	2. Alcohol	03	10.00	04	13.33	07	11.67		
	3. Tobacco	01	3.33	00	0.00	01	1.66		

<sup>NS</sup> Non-significant at p<0.05

Table 1(a) and 1(b) highlights the distribution of study subjects according to

socio demographic variables. In experimental group, maximum number of

subjects was in the age group of 46-55 years and above 56 years, male, having amputation due to crush injury and below knee amputation and receive general anaesthesia. In control group, maximum number of subjects was in the age group of 46-55 years, male, having amputation due to crush injury and below knee amputation and receive general anaesthesia.

Figure 1 shows the effectiveness of mirror therapy that mean score and standard deviation of PLP before intervention was  $7 \pm 1.050$ ,  $6.80 \pm 0.961$  and of post test PLP after 1 week of intervention was  $6.10 \pm 0.960$ ,  $6.80 \pm 1.157$  and of post test PLP after 2 weeks of intervention was  $4.90 \pm 0.923$ ,  $6.70 \pm 1.179$  in experimental and control group.

There was no significant difference (p value is 0.445) between the two groups with regard to pre test PLP at p value  $< 0.05$ . There was significant difference (p value is 0.013, 0.000) between the two groups with regard to post test PLP after 1 week and 2 week respectively at p value  $< 0.05$ .

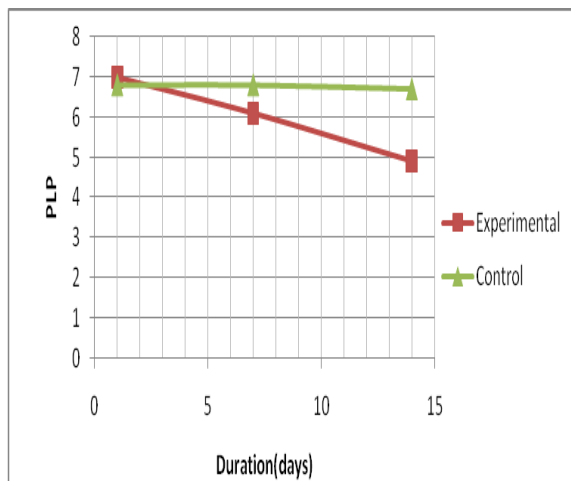


Figure 1: Effectiveness of mirror therapy on reducing PLP

## DISCUSSION

Findings of the present study revealed that the level of PLP after 2 weeks of mirror therapy was less in experimental group as compared to control group ( $t = -6.585$ ). The findings of present study are also supported by Sae Young Kim [12] in which after 1 week of mirror therapy, PLP in VAS level decreased to 7

out of 10 and after 1 month VAS was 5 out of 10. Darnall and Li [13] showed a significant reduction in PLP at month one ( $p = 0.0002$ ) when mirror therapy was delivered for 25 minutes daily and at month two ( $p = 0.002$ ). Moseley [14] reported a significant effect of mirror therapy for the treatment group ( $p = 0.002$ ), with the mean reduction of the VAS scores for the treatment group and control groups being 23.4 mm and 10.5 mm, respectively.

Another study by Chan et al [15] concluded that 100% of patients in the mirror group reported a decrease in pain. In a comparison of changes in the score on the VAS at 4 weeks, the mirror group differed significantly from both the covered-mirror group ( $p = 0.04$ ) and the mental-visualization group ( $p = 0.002$ ). Clerici et al [16] reported benefit after undergoing mirror therapy for 30 minutes per day. A significant decrease in PLP ( $p < 0.005$ ) was found by analysing the VAS scores.

## CONCLUSION

It is concluded that mirror therapy is effective in reducing PLP after 1 week of mirror therapy among amputated patients and more effective after 2 weeks of mirror therapy.

## REFERENCES

1. Ziegler-Graham K., MacKenzie, E.J., Ephraim, P.L., Trivison, T.G., & Brookmeyer, R. Estimating the prevalence of limb loss in the United States: 2005 to 2050. Archives of Physical Medical and Rehabilitation. 2008; 89(3):422-429.
2. Shahin, Qalawa, Mohamed. Quality of life and satisfaction of diabetic foot patients: Comparative study. Journal of American Science. 2013;9(1):473-75
3. Ramachandran, V.S. & Altschuler, E.L. The use of visual feedback, in particular mirror visual feedback, in restoring brain function. Brain journal. 2009; 6:1693-1710.
4. Melzack, R. Phantom limbs. Scientific American Journal. 1992; 266:120-26.

5. Davis KD, Kizz ZHT, Luo L, Tasker RR, Lozano AM, Dostrovsky JO. Phantom sensations generated by thalamic microstimulation. *Nature*. 1998; 391:385-7.
6. Kaas JH. Phantoms of the brain. *Nature*. 1998; 391:331-3.
7. Flor H, Elbert T, Knecht S et al. Phantom-limb pain as a perceptual correlate of cortical reorganization following arm amputation. *Nature*. 1995; 375:482-4.
8. Halligan PW, Marshall JC, Wade DT, Davey J, Morrison D. Thumb in cheek; sensory reorganization and perceptual plasticity after limb amputation. *Neuro Report*. 1993;4: 233-6.
9. Ramachandran VS, Rogers-Ramachandran D, Cobb S. Touching the phantom limb. *Nature*. 1995; 377: 489-490.
10. Ramachandran VS, Rogers-Ramachandran D. Synaesthesia in phantom limbs induced with mirrors. *Proceeding Biological Sciences*. 1996; 263:377-386.
11. Weeks SR, Anderson-Barnes VC, Tsao JW. Phantom limb pain: theories and therapies. *Neurologist*. 2010;16:277-286
12. Kim SY, Kim YY. Mirror Therapy for phantom limb pain. *Korean J Pain*. 2012;25:272-74
13. Darnall BD, Li H. Home-based self-delivered mirror therapy for phantom pain: a pilot study. *Journal of Rehabilitation Medicine*. 2012; 44(3): 254-60.
14. Moseley G. Lorimer; A randomized controlled trial on graded motor imagery for pathologic pain. *Neurology*. 2006; 67:2129-34.
15. Chan BL, Witt R, Charrow AP, Magee A, Howard R, Pasquina PF, et al. Mirror therapy for phantom limb pain. *National England Journal of Medicine*. 2007; 357:2206-07.
16. Clerici CA, Spreafico F, Cavallotti G et al. Mirror therapy for phantom limb pain in an adolescent cancer survivor. *Tumori*. 2012; 98(1):27-30.

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