



Impact of Nerve Gliding with Mirror Based Occupational Therapy on Hand Dexterity among People with Median Nerve Injury

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Abstract

The median nerve, commonly known as the 'eye of the hand,' is a mixed nerve that plays a crucial part in the hand's functionality. Nerve gliding is to encourage the nerve to move or glide gently. Mirror therapy (MT) is by using a mirror to create a reflective illusion of an affected limb in order to trick the brain. Dexterity can be used to demonstrate originality and precision. The purpose of this study is to determine the impact of nerve gliding with mirror based occupational therapy (OT) on hand dexterity among people with median nerve injury. The study was done using a quasi-experimental design and the convenient sampling technique was adapted to select the patient with median nerve injury in the age group of 18 years and above. Totally thirty patients and divided into two groups. 15 patients in the control group and 15 in the experimental group who underwent The pre-test and post-test were evaluate by the Purdue Pegboard Test. Totally 32 sessions were conducted, three sessions per week for about 45 minutes. The statistical analysis showed significant improvement in both groups when compared to the post scores of the both groups, there was highly statistically significant showed in the experimental group. Analysis revealed that the nerve gliding with mirror based (OT) on hand dexterity had a statistically significant effect compare to conventional occupational therapy intervention in people with median nerve injury.

Keywords: Median nerve injury, Nerve gliding, Mirror therapy, Hand dexterity.

Introduction

Median nerve injury: The median nerve, commonly known as the 'eye of the hand,' is a mixed nerve that plays a crucial part in the hand's functionality. Acute traumatic, chronic micro traumatic and compressive lesions can all affect the median nerve. The nerve can also be damaged as a result of multiple-cause degenerative processes and neuropathies. Different types of lesions can affect the median nerve at various levels along its long path from the brachial plexus and axilla to the hand.

Hand dexterity: The hands that are complex our interactions with the physical, social, and cultural environments rely heavily on agility. In a variety of activities, including musical performances, dexterity can be used to demonstrate originality and precision. The hand is the upper extremity's most active and interactive portion. Hand dexterity is a word that encompasses a wide range of hand abilities and performances. Reaction time, hand preference, wrist flexion speed, finger tapping speed, aiming, hand stability, and arm stability are only a few of them.

Mirror therapy: Mirror therapy was first proposed as a potential therapeutic intervention by **Vilayanur S. Ramachandran (1996)** to help alleviate Phantom limb pain, a condition in which patients feel they still have pain in the limb after amputation. Mirror therapy (MT) is based on the principle of using a mirror to create a reflective illusion of an affected limb to order to trick the brain into thinking movement occurred without pain or to create positive visual feedback of limb movement. It implies covering up the affected limb behind a mirror, which is positioned so that the opposing limb's reflection appears in place of the hidden limb.

Purdue Pegboard Test: The Purdue pegboard was developed in the 1940s as a test of manipulative dexterity for use in personnel selection (Tiffin, 1968, Tiffin & Asher, 1948). The Purdue Pegboard Test (**PPT: Lafayette Instrument Co., Model 30,020**) was used to

assess manual dexterity since it is a standardized and reliable test. In a word, it's a 19.7 44.9 cm board with 25 slotted holes arranged in a 5 x 5 array.

Aim of this study:

To determine the impact of nerve gliding with mirror-based occupational intervention on hand dexterity among people with median nerve injury.

Objectives of the study:

1. To find out the patient with median nerve injury.
2. To find out the impact of conventional occupational therapy on hand dexterity in the control group.
3. To find out the impact of nerve gliding with mirror-based occupational intervention on hand dexterity in the experimental group.
4. To compare the impact of the control group and experimental group on improving hand dexterity among people with median nerve injury.

Research hypothesis:

There is a statistic difference between the pre and post test score of Purdue pegboard test in control and experimental group.

Research design:

A Quasi-experimental type with quantitative method was adopted.

Sample Technique:

Convenience sampling technique was used.

Sample Size:

Totally 30 subjects were taken in this study, the subjects were divided into two groups experimental and control groups.

-) The control group consists of 15 subjects.
-) The experimental group consists of 15 subjects.

Sample Setting:

Samples were selected according to the inclusion and exclusion criteria from the Saveetha medical college and hospital, Thandalam.

Variables

-) **Independent variables:** Nerve gliding with mirror based occupational therapy
-) **Dependent variables:** Median nerve injury

Selection criteria

Inclusion Criteria:

1. Patients with median nerve injury from the age of 18 and above.
2. Both male and female.
3. Patient diagnosis with partial and complete median nerve injury by using Dash scale.
4. Patient with hand dexterity problem
5. Nerve conduction should be present

Exclusion Criteria:

1. Patients with other pathological symptoms in the hand and fingers.
2. A patient who has any metabolic diseases such as diabetes mellitus and blood pressure that could affect the restoration of the involved side was excluded.
3. Patients with Volkmann ischemic contracture.

Instrument Used:

1. Disability of Arm, Shoulder and Hand (DASH)
2. Purdue pegboard test.

Duration:

-) The duration of the study was 3 months
-) 45 minutes per session, 3 days a week
-) 32 sessions.

The procedure of the study:

The patients were divided into two equal groups, 15 subjects in the experimental group and 15 subjects in the control group. The subjects were selected for each group based on convenience. Before the intervention process had begun, written consent was obtained from the participants. The pre-test was taken from both groups using the Purdue pegboard test. The control group received conventional occupational therapy. The experimental group was given nerve gliding with mirror-based occupational therapy. Charts were made for the subject for hand dexterity. The activities were given individually for each subject. In experimental group the activities were done in front of the mirror; the subject followed the instructions provided by the examiner. A total of 32 sessions were conducted for three months. The sessions were conducted weekly thrice and lasted for 40 minutes. Both the groups were administered the Purdue pegboard test for hand dexterity again for post-test.

Intervention Protocol

Control Group:

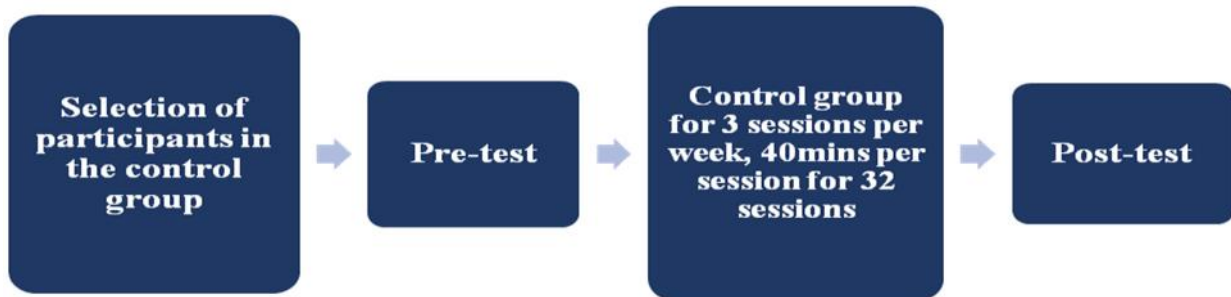
Activities were given for control group participants are Ball squeezing, cylindrical pegboard, Theraputty, Bread lacing, Paper cutting, Sewing and unsewing (nuts and bolts),

Experimental Group:

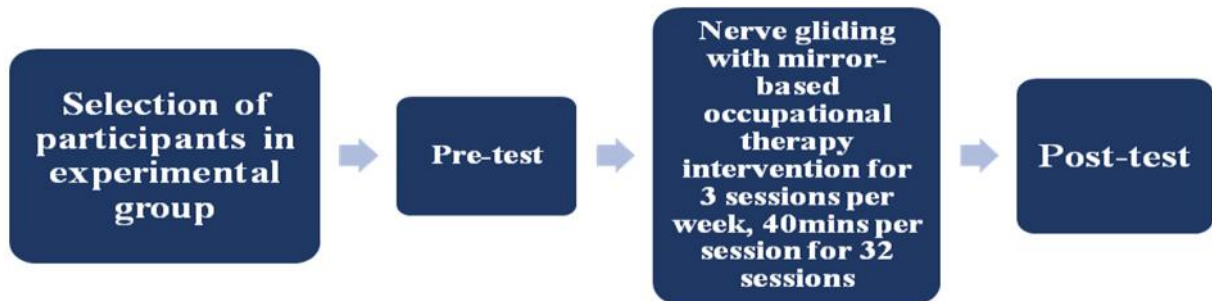
The participants in experiment group underwent intervention of never gliding with mirror –based occupational therapy.

The duration of the sessions was 45 minutes, where 10 minutes for nerve gliding was given along with 30 minutes of mirror-based occupational therapy.

Control group:



Experimental group:



Data analysis and Result

Table No: 1 Statistical analysis of pre- test and post-test in the control group

Perdue Peg Board		Mean	N	Z value	p-value
Right	Cntr_Pre	10.0933	15	-3.066	0.002*
	Cntr_Post	12.0267	15		
Left	Cntr_Pre	10.3533	15	-2.788	0.005*
	Cntr_Post	12.42	15		
Both	Cntr_Pre	7.2867	15	-3.411	0.001*
	Cntr_Post	10.2867	15		
Assembly	Cntr_Pre	17.2333	15	-3.413	0.001*
	Cntr_Post	20.54	15		

***Significant at 5% alpha level**

Since the p-value is lesser than 0.05 in all 4 categories (Right, Left, Both, and Assembly), an **alternate hypothesis is accepted**. Hence, there is a statistically significant difference between pre-

test and post-test scores in the Control Group of the Perdue Peg Board. This suggests that the intervention received by the control group, that is **conventional OT had significant improvement**.

Graph: 1 Comparison of pre-test and post-test in the control group

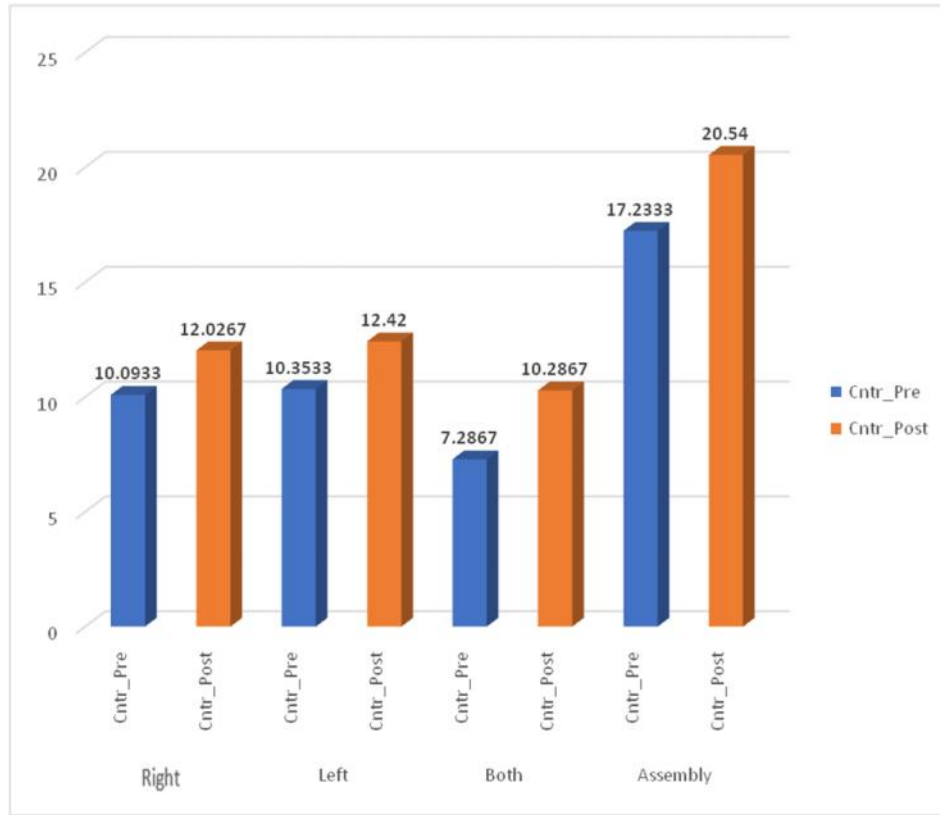


Table No: 2 Statistical analysis of pre-test and post-test in the experimental group

Perdue Peg Board		Mean	N	Z value	p-value
Right	Expt_Pre	10.4267	15	-3.296	0.001*
	Expt_Post	15	15		
Left	Expt_Pre	10.8067	15	-3.323	0.001*
	Expt_Post	15.1	15		
Both	Expt_Pre	7.8733	15	-3.412	0.001*
	Expt_Post	12.7267	15		
Assembly	Expt_Pre	17.72	15	-3.413	0.001*
	Expt_Post	23.8133	15		

* Significant at 5% alpha level

In the Experimental group, since the p-value of 0.001 is less than 0.05 in all 4 categories (Right, Left, Both, and Assembly), **an alternate hypothesis is accepted**. Hence, there is a statistically significant difference in the Experimental Group between pre-test and post-

test scores of the Perdue Peg Board. This suggests that the intervention received by the experimental group had significant improvement, that is **nerve gliding with mirror-based intervention had significant improvement**

Graph: 2 Comparison of pre-test and post-test of the experimental group

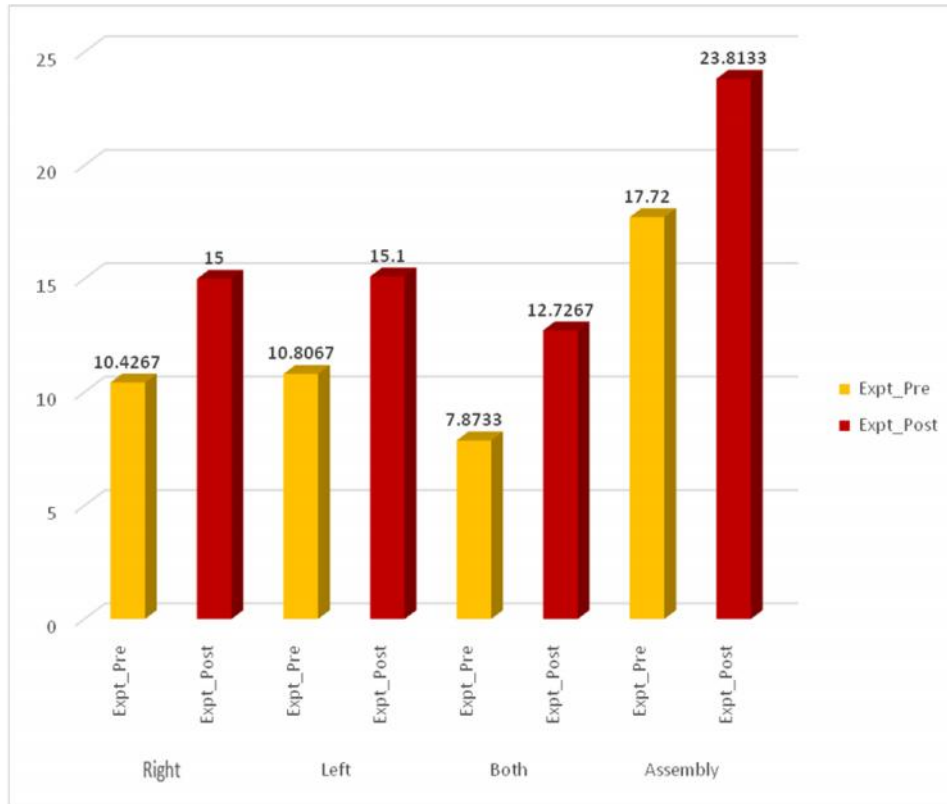


Table No: 3 Statistical analyses of the post-test scores of the control and experimental group

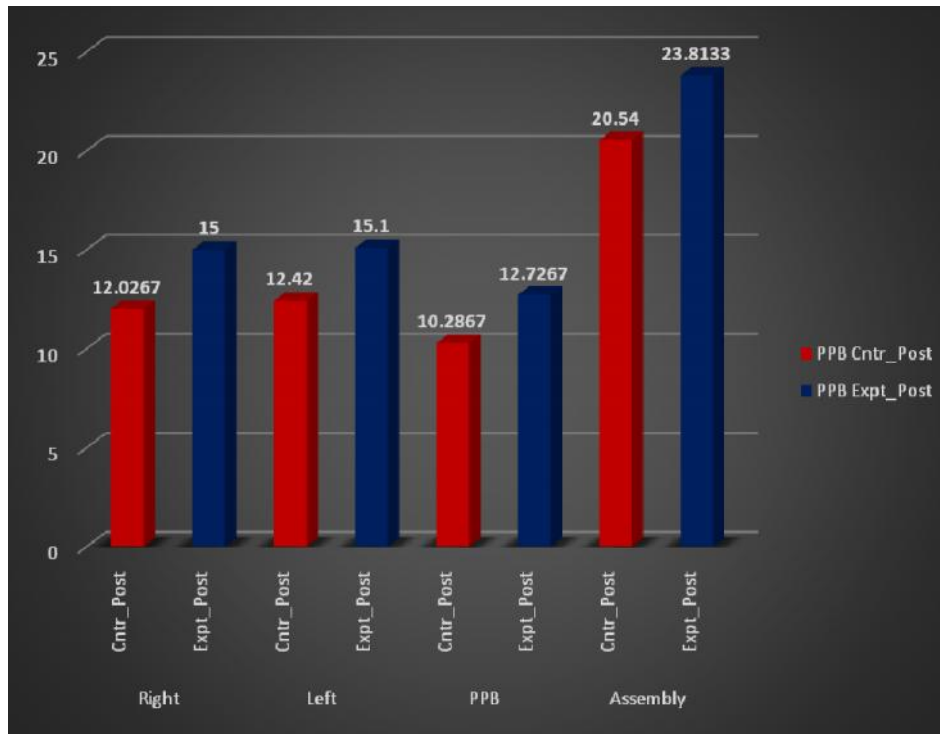
Perdue Peg Board		Mean	N	Z value	p-value
Right	Cntr_Post	12.0267	15	3.13159	0.00174*
	Expt_Post	15	15		
Left	Cntr_Post	12.42	15	2.11538	0.034*
	Expt_Post	15.1	15		
Both	Cntr_Post	10.2867	15	3.42194	0.00062*
	Expt_Post	12.7267	15		
Assembly	Cntr_Post	20.54	15	2.82051	0.0048*
	Expt_Post	23.8133	15		

*Significant at 5% alpha level

Since the p-value is lesser than 0.05 in all 4 categories (Right, Left, Both, and Assembly), an **alternate hypothesis is accepted**. Hence, there is a statistically significant difference in post-test scores between the Experimental and Control Group of the Perdue Peg Board. This suggests

that the intervention received by the experimental group had more improvement when compared to the control group, that is **nerve gliding with mirror-based intervention had significant improvement when compared to conventional OT**.

Graph: 3 Comparison between post-test scores of the control and experimental group



Discussion

The purpose of this study is to examine the impact of nerve gliding with mirror-based occupational therapy on hand dexterity among people with median nerve injury.

Table:1 and Graph:1 shows the comparison of the pre-test and post-test of the control group.

-) **Mean scores** of Right Hand 10.0933 and 12.0267, Left Hand 10.3533 and 12.42, Both Hand 7.2867 and 10.2867, Assembly 17.2333 and 20.54
-) **‘Z’ value** of Right Hand -3.066, Left Hand -2.788, Both Hand -3.411, Assembly -3.413

) **p-value** of Right Hand 0.0028*, Left Hand 0.005*, Both Hand 0.001*, Assembly 0.001* which indicates that there is a statistically significant difference between pre-test and post-test scores in the control group of the Perdue Peg Board. This suggests that the intervention received by the control group had significant improvement. This correlates with the study of **Tanya Cole, and Rebecca Nicks**; titled **Outcomes after occupational therapy intervention for traumatic brachial plexus injury: A prospective longitudinal cohort study**. The result was that people who have had a traumatic BPI benefitted from occupational therapy combined with surgical intervention to increase strength, range of motion, and upper limb function.

The previous study had used a sensorimotor retraining and activity-based rehabilitation technique because of which the result was effective. In the current study, a similar technique like nerve gliding and activity-based rehabilitation was implemented for the participants in the group.

conducted for 30 minutes. The current study utilized participants who had nerve conduction and the intervention was given for 40 minutes per session for 32 sessions.

Table: 2 and Graph: 2 shows the comparison of the pre-test and post-test of the experimental group.

-) **Mean scores** of Right Hand 10.4267 and 15, Left Hand 10.8067 and 15.1, Both Hand 7.8733 and 12.7267, Assembly 17.72 and 23.8133
-) **'Z' value** of Right Hand -3.296, Left Hand -3.323, Both Hand -3.412, Assembly -3.413
-) **p-value** of Right Hand 0.001*, Left Hand 0.001*, Both Hand 0.001*, Assembly 0.001*

Which indicates that there is a significant improvement between the pre-test and post-test in the experimental group. This suggests that the statistical improvement in the experimental group on the application of nerve gliding with mirror-based occupational therapy between the pre-test and post-test scores of the Purdue pegboard test. This result was not in another study conducted by **Mayara H. Paula, Rafael I. Barbosa, and Alexandre M. Maracolino**, titled "A study on Early Sensory Re-Education of The Hand After Peripheral Nerve Repair Based on Mirror Therapy". This study analyses the short-term functional outcome of an early re-education program using mirror therapy compared to a late classic sensory program for hand nerve repair. The result showed that MT was not shown to be more effective than late sensory re-education. The study utilized participants of the early nerve injury state with no re-innervations of the nerve, this might have been one reason for the result to be non-significant. Also, the intervention was provided for 3 sessions post-operatively and each session was

Table: 3 and Graph: 3 showed the statistical analysis of the post-test of the Purdue pegboard test in the control and experimental group.

-) **Mean scores** of Right Hand 12.0267 and 15, Left Hand 12.42 and 15.1, Both Hand 10.2867 and 12.7267, Assembly 20.54 and 23.8133
-) **'Z' value** of Right Hand 3.13159, Left Hand 2.11538, Both Hand 3.42194, Assembly 2.82051
-) **p-value** of Right Hand 0.00147*, Left Hand 0.034*, Both Hand 0.00062*, Assembly 0.0048*

Hence, there is a highly statistically significant difference in post-test scores between the Experimental and Control groups. This suggests that the intervention received by the experimental group had more improvement when compared to the control group. The results were similar to the previous study conducted by an **Eun Yun, M Young-Kwon Kim**, titled "a study on Effects on MT On Muscle Activity, Muscle Tone, Pain and Function in Patients with Mutilating Injuries". This study assessed the effectiveness of MT on muscle elasticity, pain, and function in patients with mutilating injuries, the experimental group (n=15) receive MT and conventional physical therapy (CPT) while the control group receive only (CPT). There were significant differences in pain and hand function within each group and between groups (experimental vs. control) ($p < .05$). However, there was no significant difference in muscle elasticity between groups ($p > .05$). Thus, MT can be effective for patients with impaired function due to mutilating injury.

Conclusion

The study investigated the impact of nerve gliding with mirror-based occupational therapy on hand dexterity among people with median nerve injury.

The study was conducted over an intervention period of three (3) months. Totally 30 median nerve injury subjects were selected for the study, fifteen (15) subjects in the experimental and fifteen (15) subjects in the control group. Pre-test and post-test were conducted for both groups using the Purdue pegboard test. The experimental group undergoes nerve gliding with mirror-based occupational therapy whereas the control group received only conventional occupational therapy.

The result showed that there was a highly significant difference between the post scores of the control and experimental group. It indicated that there were highly significant improvements in the experimental group because of nerve gliding with mirror-based occupational therapy to improve hand dexterity.

From this study, the result suggests that nerve gliding and mirror therapy can be incorporated into occupational therapy management for other conditions on improving hand dexterity.

Limitations

-) The study was done with a limited sample size
-) The duration of the study was short
-) The study was done only in mild and moderate median nerve injury patients

Recommendation

-) The study can be carried out for a longer duration
-) The study can be done with a larger sample

-) The study can be done for other conditions including stroke, brachial plexus, phantom limb pain, chronic regional pain syndrome, etc.,

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Conflicting Interest: None

Ethics Clearance: Approval from Institution Scientific Review Board (ISRB) was obtained prior to the study.

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