International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Effect of Neurodynamic Mobilization on Precision Grip Among Healthy Individuals

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Abstract

Over the last three decades, insights into in investigations of conducted with fit volunteers utilizing Microneurography Technique 1 the significance of the median nerve in precise grip control was shown or or a nerve anesthesia block at the wrist or hand. Accurate grip requires proper adjustment of the grip force (GF) perpendicular to the grip surface of the object and the tangential load (LF). Prevents objects from slipping and prevents premature muscle fatigue. The primary objective of neurodynamic techniques (NDT), a form of manual therapy, is to deliver forces to the brain by manipulating different joints and their positions. According to the notion of neural mobilization, changes in the mechanics or physiology of the nervous system can lead to additional system dysfunctions or problems in the musculoskeletal tissues that it innervates. The study's goal is to determine if neuromobilization impacts healthy people's ability to execute the key pinch, three-jaw chuck, and tip-to-tip pinch A Quasi-experimental study was done in Saveetha physiotherapy OPD, Saveetha medical college, and hospital Thandalam, Chennai. All the 30 patients were assessed using pinch meter for dominant hand and non-dominant hand. After 4 weeks, the same test was evaluated as post-test measurements. The test shows statistically significant effect ($p<0.0001$) The statistical study revealed that the neurodynamic mobilization tends to improve precision grip among the healthy individuals. From the results it is concluded that neurodynamic technique is effective in improving the precision grip in healthy individuals. The individuals with ULTT1 test positive were given with treatment and significant improvement in key pinch, three jaw chuck pinch, tip to tip pinch.

Keywords: Pinch meter, Neuromobilization, ULTT1, Key pinch, three jaw chuck pinch, tip to tip pinch

1.INTRODUCTION:

Over the last three decades, insights into into in investigations of conducted with fit volunteers utilizing Microneurography Technique 1 the significance of the median nerve in precise grip control was shown or a nerve anesthesia block at the wrist or hand [(1)]. Accurate grip requires proper adjustment of the grip force (GF) perpendicular to the grip surface of the object and the tangential load (LF). Prevents objects from slipping and prevents premature muscle fatigue. This adjustment is motion prediction that allows a person to generate appropriate GFs based on sensorimotor information (feedforward system) and reactions that need to bemodified based on activation based on actual motion. It derives from the ability

to update these predictions through a mechanism [2]. Precision grip that is seemingly easy with healthy hands affected by pathological conditions that affect the center Peripheral mechanisms that interfere with binding Between gripping force and load force [3]. Neurodynamic techniques can be classified into techniques aimed at mobilizing the structure surrounding the nervous system, or techniques aimed at mobilizing the nervous system itself [4].

The primary objective of neurodynamic techniques (NDT), a form of manual therapy, is to deliver forces to the brain by manipulating different joints and their positions. According to the notion of neural mobilization, changes in the mechanics or physiology of the nervous system can lead to additional system dysfunctions or problems in the musculoskeletal tissues that it innervates, according to the theory of neural mobilization. The neural mobilization technique is used to restore the nervous system's movement and flexibility with the goal of enhancing neurodynamics and reestablishing axoplasmic flow, hence restoring nerve tissue homeostasis and promoting the return of normal functioning. It can also be used to recover joint flexibility [6]. Neuromobilization is a treatment protocol that aims to restore neural system plasticity. The goal of mobilization is to increase collagen flexibility, which keeps the nerve intact and allows it to move in relation to its surroundings [7]. Repetitive motions of the parts are being used in neural mobilization techniques to replicate symptoms and establish a combination of distal movements for more proximal segments [8]. The nerve structures can be stimulated more easily when a mechanical force is applied. The authors also emphasize the importance of incorporating factors such as physiology with neural emphasis, neural tissue sensitivity, and the effects of slides in structures adjacent to the nervous system, stating that neurodynamic tests distinguish among normal and abnormal nervous systems based on mechanosensitivity [9]. The median nerve block reduced average grip force by 20% in pincer grip, 29.5% in pinch grip, 39.5% in precision grasp, and 70.7% in palmar abduction [10]. The median nerve block significantly reduced pinch performance, as measured by erroneous pulp-to-pulp contact of the thumb to the index finger and changes in digit joint motion [11]. Some ULTT1 components and sensitizing procedures enhance median nerve tension whereas others have no statistically significant impact. Elbow and wrist extension, contralateral and as a result of Tension and its potential mechanical and physiological effects on brain tissue and related connective tissues have yet to be shown [12].

The median nerve ULTT 1 can be regarded as a valid nerve tension test due to its tensile force distribution and consideration of both sensitivity and specificity [13]. ULNTs are potentially useful assays for identifying PNP. A positive ULNT should recapitulate the patient's symptoms at least partially, and structural differentiation should change these symptoms [14]. Michel W. Coppieters, David S. Butler have proven that the results clearly show that different types of nerve gliding workouts have significantly diverse mechanical effects on the peripheral nervous system. The location or simultaneous movement of a nearby joint has a considerable influence on the longitudinal excursion and strain associated with a specific joint movement [15].

OBJECTIVE OF THE STUDY

- To determine the effects of neuromobilisation on key pinch among the healthy individuals.
- To determine the effects of neuromobilisation on three jaw chuck pinch among the healthy individuals.
- To determine the effects of neuromobilisation on tip to tip pinch among the healthy individuals.

REVIEW OF LITERATURE

Dierick F et al (2021) concluded that the findings imply the precise mechanical stress across the median nerve is not required for the NDT treatment of CTS mechanisms of action. Improvements to the temporal summation, on the other hand, were only seen in subjects who received the NDT. Lewis J (1998) concluded that some ULTT l components and sensitizing techniques increase median nerve tension while others have no statistically significant effect 3. Dun s et al (2007) concluded that Increases in the safety margin, grip force variation, and the area of center of pressure migration of the grip force all show that a lower median nerve block at the wrist affected precision grip. Boudier-Revéret M (2017) et al concluded five minutes of passive NDM in the form of stretching or sliding technique produced substantial free flowing scattering in the median nerve of unpreserved human cadavers' carpal tunnel. This research lends support to the clinical methodology of NDM in reducing intraneural edema.Elsayed E et al (2019) The median neurodynamic mobilization technique can improve hand grip strength and pain in patients with chronic CR.

METHODOLOGY

The study was conducted on 30 subjects using convenient sampling method based on the inclusion criteria and exclusion criteria. The test was clarified to the subject and written consent was obtained. This study was conducted as a Qausi-experimental study. The pretest values were measured using pinch meter for dominant hand and non-dominant hand. All of 30 subjects were given with neurodynamic mobilization for 2 weeks, 5 days a week and one session a day. The tensioning maneuver will involve shoulder depression, abduction, and external rotation to 90 degrees, extending the elbow, forearm supination, and contralateral cervical spine side bend. Elbow extension, forearm supination, ipsilateral cervical spine side bending, shoulder depression, abduction, and external rotation to 90 degrees will all be part of the sliding maneuver. The precision grip strength will be assessed using pinch grip test. The pre and posttest values will be measured with pinch meter. The tensioning maneuver will involve shoulder depression, abduction, and external rotation to 90 degrees, extending the elbow, forearm supination, and contralateral cervical spine side bend. Elbow extension, forearm supination, ipsilateral cervical spine side bending, shoulder depression, abduction, and external rotation to 90 degrees will all be part of the sliding maneuver. For gliding technique elbow and cervical movement are done towards the same direction when right elbow is flexed, cervical lateral flexion to left is performed. For stretching technique is done in opposite direction.

Hypothesis of the study

Hypothesis 01

H0: There will be no significant effect of neurodynamic mobilization on key pinch among healthy individuals.

H1: There will be significant effect of neurodynamic mobilization on key pinch among healthy individuals

Hypothesis 02

H0: There will be no significant effect of neurodynamic mobilization on three jaw chunk pinch among healthy individuals

H1: There will be significant effect of of neurodynamic mobilization on three jaw chunk pinch among healthy individuals

Hypothesis 03

H0: There will be no significant effect of of neurodynamic mobilization on tip to tip control among healthy individuals

H1: There will be significant effect of of neurodynamic mobilization on tip to tip control among healthy individual

RESULTS

From statistical analysis made with quantitative data revealed statistically that neurodynamic mobilization technique for the healthy individuals with ULTT 1 positive had significant improvement in precision grip. Total 30 subjects in which 15 male and 15 female individuals were selected. The pre and posttest values for key pinch in male was pretest values for dominant hand is 6.373 and posttest values 9.620 and for non-dominant hand is 4.753 and post-test values is 8.54. In females the key pinch values for dominant hand the pretest value was 3.960 and post value 7.133 and for non-dominant hand the pre value was 3.46 and post value was 6.540. The three jaw chuck pinch value for male dominant hand the pretest value was 11.487 and the post values 15.033, for non-dominant hand was the pre value 4.253 and the post value was 5.913. The three jaw chuck for female dominant the pretest values 7.6643 and post value was 11.4586, the non-dominant 3.200 and post value 4.520. The tip to tip pinch for male dominant hand pretest values 5.487 and post value 7.693 respectively, the non-dominant the pre-test values 4.320 and posttest values 6.193. The tip to tip pinch for female dominant hand the pretest value 4.520 and post value 5.820, the non-dominant hand pretest was 4.52 and post value was 5.447. This proves that the neurodynamic mobilization technique is effective in reliving the median nerve and thus proving the precision grip such as key pinch, three jaw chuck, tip to tip pinch. There was significant increase in pinch meter values after giving neural mobilization. Thus neurodynamic mobilization technique is effective treating in individuals with ULTT1 test positive and improving precision grip

TABLE 1: Pre and post-test for key pinch in male and female in pinch meter for dominant hand

pinch meter	Mean		SD		t-Value	P-Value
	Pre test	Post test	Pre test	Post test		
Male	6.373	9.620	0.411	0.761	13.0004	< 0.0001
Female	3.960	7.133	0.452	0.481	18.9815	<0.0001

Graph 1: pre and post-test values in male for key pinch in dominant hand

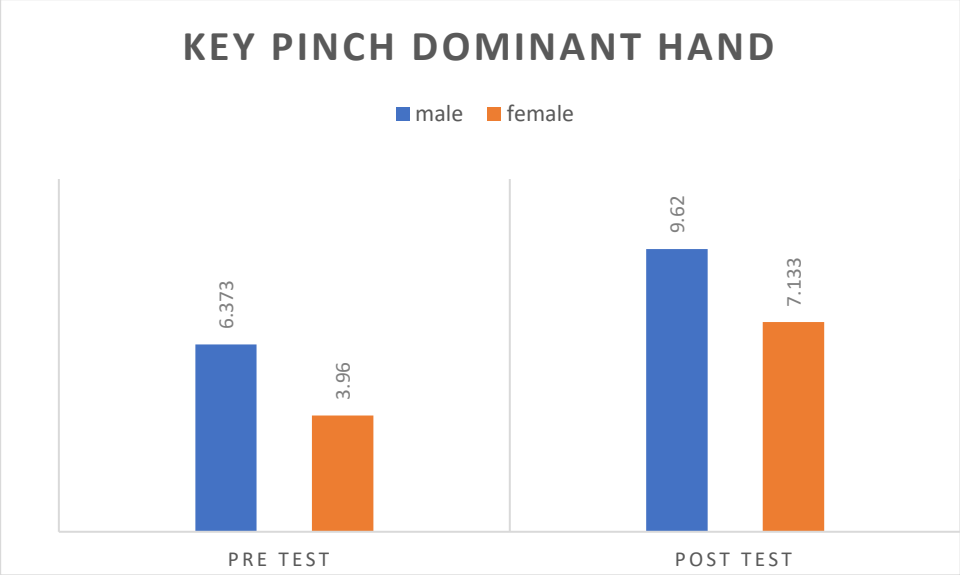


TABLE 2 : Pre and post-test values for male and female in non-dominant hand for key pinch

Pinch meter	Mean		SD		t-Value	P-Value
	Pre test	Post test	Pre test	Post test		
Male	4.753	8.540	0.331	0.628	20.0407	< 0.0001
Female	3.46	6.54	0.421	0.497	17.2899	<0.0001

GRAPH 2: Pre and post-test values for male and female in non-dominant hand for key pinch

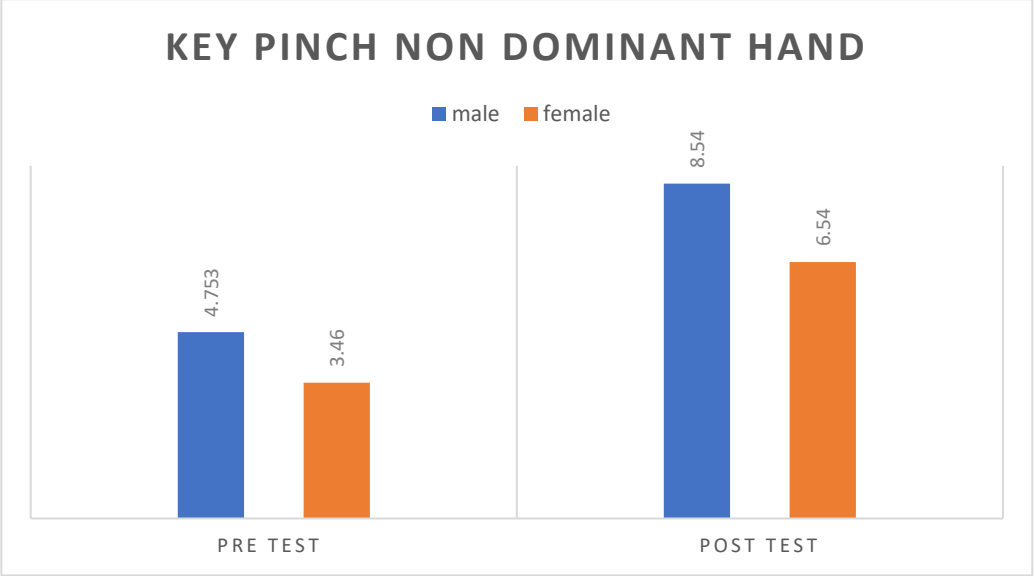


Table 3: Pre and post-test values for three jaw chuck pinch in male and female dominant hand

Pinch meter	Mean		SD		t-Value	P-Value
	Pre test	Post test	Pre test	Post test		
Male	11.467	15.033	1.165	0.297	11.712	< 0.0001
Female	7.6643	11.458	0.7110	0.85	16.3330	<0.0001

Graph 3: Pre and post-test values for three jaw chuck pinch in male and female dominant hand

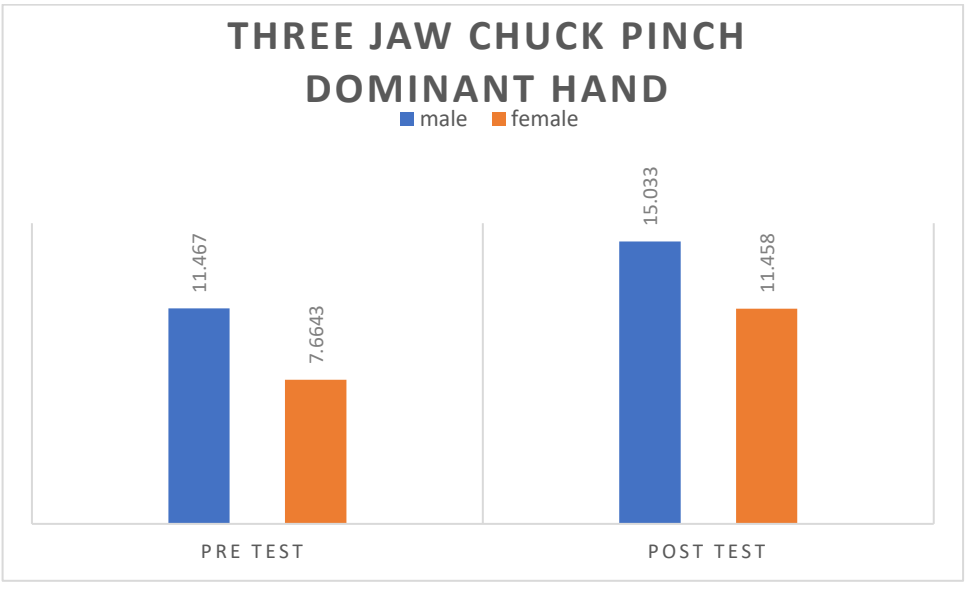


Table 4: Pre and post-test values for three jaw chuck pinch in male and female non-dominant hand

Pinch meter	Mean		SD		t-Value	P-Value
	Pre test	Post test	Pre test	Post test		
Male	4.253	5.913	0.223	0.285	18.923	< 0.0001
Female	3.200	4.520	0.259	0.254	11.5476	<0.0001

Graph 4: Pre and posttest values for key pinch in female non-dominant hand

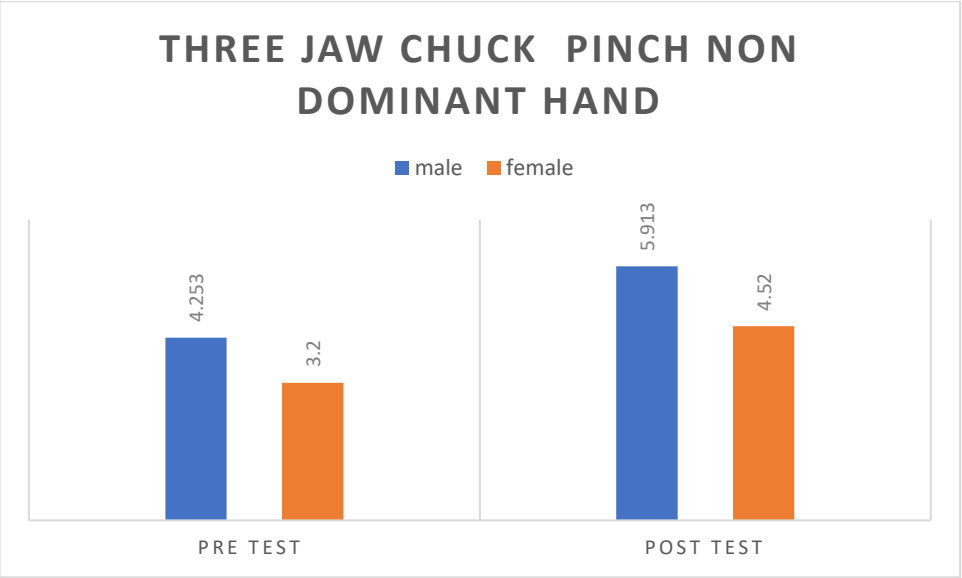


Table 5: Pre and post-test values for tip to tip pinch in male and female dominant hand

	Mean		SD		t-Value	P-Value
	Pre test	Post test	Pre test	Post test		
Male	5.487	7.693	0.707	0.87	10.923	< 0.0001
Female	4.520	5.820	0.399	0.283	9.6136	<0.0001

Graph 5: Pre and post-test values for tip to tip pinch in male and female dominant hand

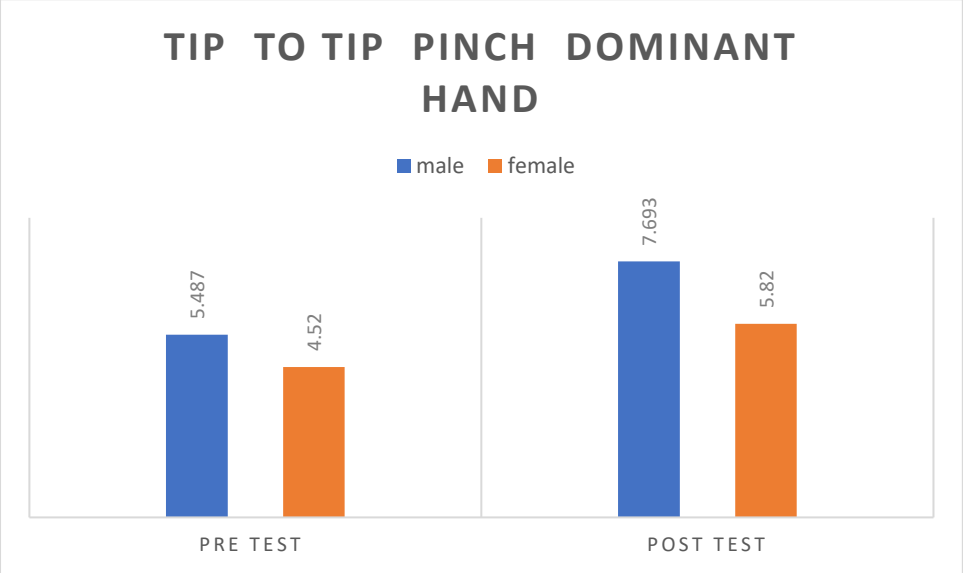
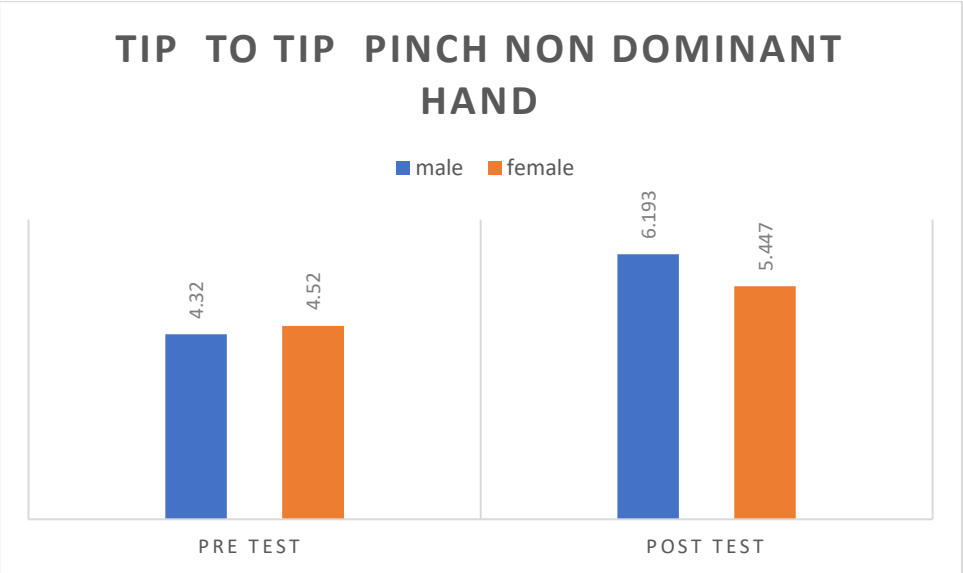


Table 6: Pre and post-test values for tip to tip pinch in male and female non dominant hand

	Mean		SD		t-Value	P-Value
	Pre test	Post test	Pre test	Post test		
Male	4.320	6.193	0.639	0.72	10.496	< 0.0001
Female	4.520	5.447	0.399	0.45	6.6406	<0.0001

Graph 6: Pre and posttest values for three jaw chuck pinch in male non-dominant hand



LIMITATIONS AND SUGGESTIONS;

In this study, the sample recruitment was not sufficient. We focused exclusively on neural mobilization in this study; intrinsic muscle training wasn't really acknowledged. In this study only one particular nerve was assessed and treated. Highly recommended diagnostic tools like EMG, NCV can be used. A lengthy study with suitable sample size is advised to increase the study's validity.

CONCLUSION:

From the results it is concluded that neurodynamic technique is effective in improvingthe precision grip in healthy individuals. The individuals with ULTT1 test positive weregiven with treatment and significant improvement in key pinch, three jaw chuck pinch,tip to tip pinch.

CONFLICT OF INTEREST:

There is no conflict of interest.

ACKNOWLEDGMENTS

We thank the participants who participated to complete this research

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