

A Study to Compare the Effectiveness of Neurodynamic Sliding Versus PNF Stretching on Calf Flexibility among Bus Drivers

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Abstract:-

BACKGROUND: Calf muscle tightness (i.e., decreased flexibility) associated with decreased in ankle movements as well as many disorders such as Achilles Tendinitis, Plantar fasciitis and muscle and joint sprain .The Repetitive task such as pedaling and prolonged Sitting which may cause excessive stress & thus affect the drivers by causing the calf muscle tightness. The Present study is done to find out the effectiveness of Neurodynamic Sliding Technique versus PNF stretching on calf flexibility among bus drivers.

PURPOSE: To find out the effectiveness of Neurodynamic sliding versus PNF stretching on calf muscle flexibility among bus drivers.

METHODOLOGY: The study design was an comparative study. 20 subjects were randomly allocated into two groups. Group A received Neurodynamic sliding technique and group B received PNF stretching for 6 weeks. Both the group were assessed by using outcome measures like Weight bearing lunge test (WBLT), Numerical Pain rating scale (NPRS).

RESULT: Data analysis was done by using a paired and unpaired 't' test for within the group and between the group. Statistical analysis for between the group showed significant improvement in Group B ($p < 0.0005$). The result of the study shows that Group B has more impact in reducing the tightness and pain and improving ROM than Group A among bus drivers.

CONCLUSION: The study concluded that PNF stretching (GROUP B) shows a more significant effect on calf muscle flexibility among bus drivers after 6 weeks of intervention when compared with GROUP A.

Keywords:- Calf muscle flexibility, Neurodynamic Sliding Technique, PNF Stretching, Weight Bearing Lunge test, NPRS.

I. INTRODUCTION

Professional Drivers are defined as Workers whose main task is to operate a motor vehicle, such as chauffeurs and Bus, Trunk, Tram, Trolley, Taxi and Ambulance Drivers¹. The repetitive task such as handling, pedaling and prolonged sitting which may place excessive stress affects the driver's personal and social life². Previous research has reported high prevalence of MSP in bus drivers (80%), truck drivers (81%), and taxi drivers (71%), with low back pain (LBP) being one of the most commonly reported MSP³.

Flexibility is the range of mobility of a joint or collection of joints that allows one to move efficiently over their full ROM. Tightness restricts the movement which may leads to various injury leads to lower the efficiency of the task performed⁵.

The Calf muscle is composed of the Gastrocnemius and the Soleus muscle that attached to the strong calcaneal (Achilles) tendon. It plays an important role in postural control and in Gait. Calf muscle tightness (i.e., decreased flexibility or increased stiffness) is associated with decrease in ankle movements as well as many disorders such as Achilles Tendinitis, Plantar fasciitis and muscle and joint sprain. Reduced range of motion of the ankle for dorsiflexion due to calf tightness leads to difficulties in maintaining the center of mass in the weight-bearing posture, and such limited dorsiflexion induces a compensatory movement in the ankle, resulting in leg deformation⁶.

PNF is an advanced technique for stretching out the body to improve flexibility. PNF makes use of this muscle activity to take advantage of specific neuromuscular characteristics and enable a Longer stretch. PNF technique have broad application in treating people with neurological and musculoskeletal condition, especially in rehabilitating the Shoulder, Hip, Knee and Ankle Joint⁹. The most common PNF technique is termed "contracts relax" or more correctly "holds relax". This is where the tight muscle is placed into a passive stretch, the tight muscle is activated isometrically, and then the muscle is stretched further, here's step by step PNF. example for attempting to increase dorsiflexion⁷.

The relationship between the nerve system, mechanics and physiology is called Neurodynamic. Changes in neural mechanics or physiology may lead to pathodynamics. Stretching or moving could cause changes in neurodynamics, and altering feeling might explain the reported improvement in flexibility⁸.

Hence this study was undertaken to compare the Effectiveness of Neurodynamic sliding versus PNF Stretching in improving the calf muscle flexibility among bus drivers.

II. NEED AND AIM OF THE STUDY

The need of the study to improve the calf flexibility by using Neurodynamic sliding and PNF stretching. Various protocols have been published to improve calf flexibility. But there is no specific study regarding the Neurodynamic sliding technique and PNF stretching in improving calf muscle flexibility among drivers.

Aim of this study is to compare the effectiveness of neurodynamic sliding versus PNF stretching on calf flexibility among bus drivers.

III. METHODOLOGY

This study was an comparative study conducted for bus drivers at Sri Venkateshwaraa college of physiotherapy, Ariyur, Puducherry for the duration of 6 weeks. Sample size of 20 has been randomly selected for this study and divided into two groups, with 10 members in each group. The outcome tool used are: WBLT (Weight bearing lunge

test) for assessing calf muscle tightness and NPRS (Numerical Pain Rating Scale) for assessing Pain.

A. SELECTION CRITERIA

The bus drivers of age group 25-50, who has calf muscle tightness with the WBLT score ranging less than 6cm and the NPRS score between 4-6 (moderate pain) has been included in this study. Drivers who have undergone surgery or any fractures of lower limb or disc hernia/ protrusion has been excluded from this study.

B. PROCEDURE

This study was conducted on 20 bus drivers between the age group of 25-50. The subjects were allocated into two groups. Group A received Neurodynamic sliding technique and Group B received PNF Stretching.

➤ GROUP A : NEURODYNAMIC SLIDING TECHNIQUE

PATIENT POSITION : supine lying

THERAPIST POSITION : beside the patient

METHOD : THE OBJECTIVE of the technique is to produce a sliding movement of neural structure relative to their adjacent tissue .

The patient in supine lying with
Hip – Flexion , Adduction, Internal rotation.
Knee – Full extension.
Ankle – Dorsiflexion, Eversion.
Toe – Eversion

FREQUENCY: 3 Session/Week

INTENSITY: 30 sec / 6 repetition



Fig 1: Neurodynamic sliding technique

➤ GROUP B - PNF TECHNIQUE

PATIENT POSITION: Supine Lying

THERAPIST POSITION: Beside the Patient.

METHOD: The Therapist passively Plantar flex the patient ankle joint to a point of muscular restriction. When this position was attained, the patient was instructed to

dorsiflex the ankle joint with maximum force (Isometric contraction) against the resistance provided by the therapist for 5sec. Then the patient was then instructed to completely relax the ankle musculature while the therapist passively plantar flex the ankle joint for 5 sec to a newly attained point of Musculature restriction.



Fig. 2: Proprioceptive neuromuscular facilitation

FREQUENCY: 3 Session /week

INTENSITY: 20 sec / 4 Repetition.

IV. STATISTICAL ANALYSIS

Within The Group Analysis Of Weight Bearing Lunge Test:

Table 1: Showing the pre and posttest values of Group A: (paired t-test values)

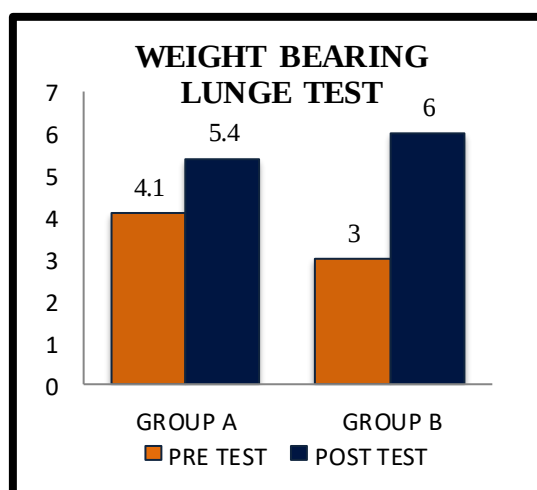
GROUP-A	Mean	SD	t- value	P- value
Pre test	4.80	0.63	6.0908	<0.0005
Post test	3.50	1.08		

The 't' value WEIGHT BEARING LUNGE TEST in Group A is **8.5150** and considered statistically significant ('p' < **0.0005**)

Tab.2: Showing the pre and post test values of Group B: (paired t-test values)

GROUP-A	Mean	SD	t- value	' p' - value
Pretest	4.10	1.20	8.5150	<0.0005
Post test	5.40	1.43		

The 't' value WEIGHT BEARING LUNGE TEST in Group B is **11.1803** and considered statistically significant ('p' < **0.0005**)



Graph 1: Within the Group Analysis of WBLT

Within The Group Analysis Of Numerical Pain Rating Scale

Table 3: Showing the pre and posttest values of Group A: (paired t-test values)

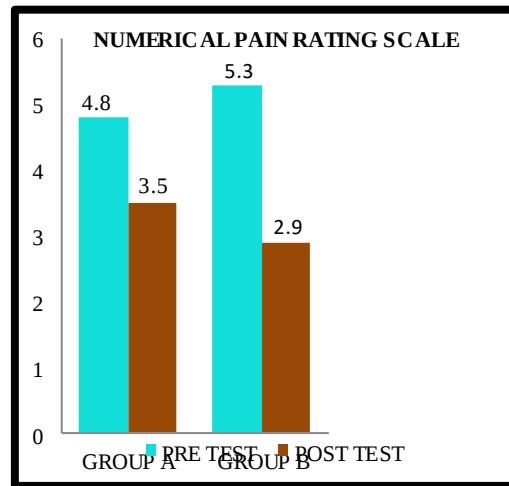
GROUP-B	Mean	SD	't'- value	'p'- value
Pre test	3.50	0.27	11.1803	<0.0005
Post test	6.00	0.94		

The 't' value NPRS in Group A is 6.0908 and considered statistically significant ('p' < 0.0005)

Tab.4: Showing the pre and posttest values of Group B: (paired t-test values)

GROUP-B	Mean	SD	't'- value	'p'- value
Pre test	5.30	0.82	14.6969	<0.0005
Post test	2.90	0.74		

The 't' value NPRS in Group B is 14.6969 and considered statistically significant ('p' < 0.0005)



Graph 2: Within the Group analysis of NPRS

Within The Group Analysis Of Rom For Dorsiflexion:

Tab.5: Showing the pre and posttest values of Group A: (paired t-test values)

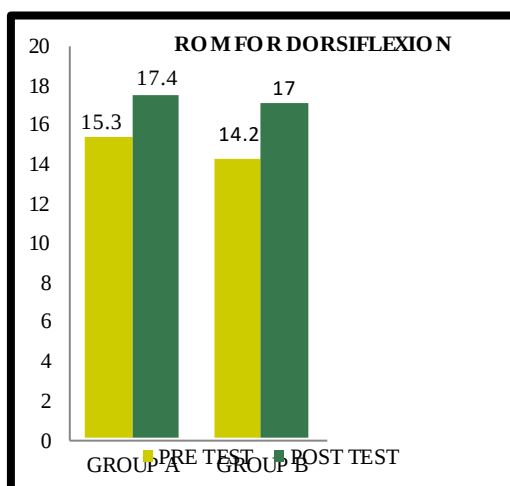
GROUP-A	Mean	SD	t- value	P- value
Pre test	15.30	2.31	11.6988	<0.0005
Post test	17.40	2.01		

The 't' value ROM For DORSIFLEXION in Group A is 11.6988 with 9 degrees of freedom and considered statistically significant ('p' < 0.0005)

Table 6: Showing the pre and posttest values of Group B: (paired t-test values)

GROUP-B	Mean	SD	't'- value	'p'- value
Pre test	14.20	2.15	14.0000	<0.0005
Post test	17.00	1.70		

The 't' value ROM For DORSIFLEXION in Group B is 14.0000 and considered statistically significant ('p' < 0.0005)



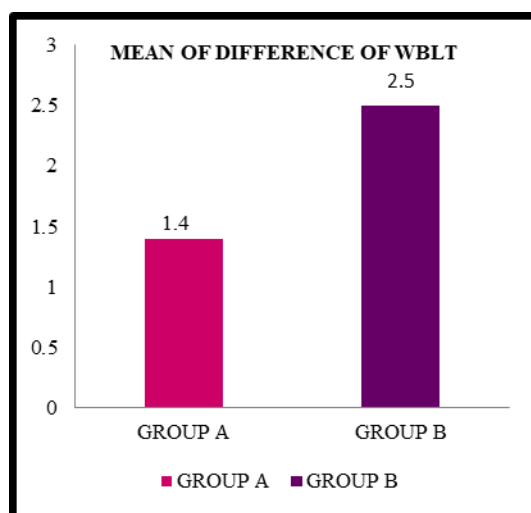
Graph 3: Within the Group analysis of ROM FOR DORSIFLEXION

Between The Group Analysis Of Weight Bearing Lunge Test:

Table 7: Showing the mean of differences of group A & B: (unpaired t-test values)

GROUP	Mean	SD	t- value	'p'- value
GROUP-A	1.40	0.52	3.9792	<0.0005
GROUP-B	2.50	0.71		

The 't' value of WEIGHT BEARING LUNGE TEST between the groups is **3.9792** and considered statistically significant (**p < 0.0005**)

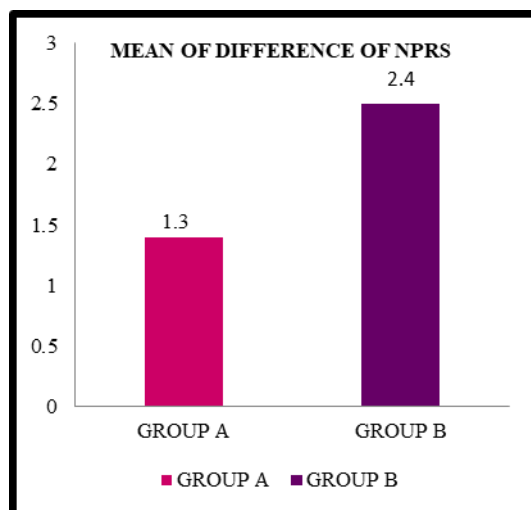


Graph 4: Between the group analysis of WBLT

Between The Group Analysis Of NPRS :

Tab.8: Showing the mean of differences of group A & B: (unpaired t-test values)

	Mean	SD	t- value	'p'- value
GROUP-A	1.30	0.67	4.0931	<0.0005
GROUP-B	2.40	0.52		



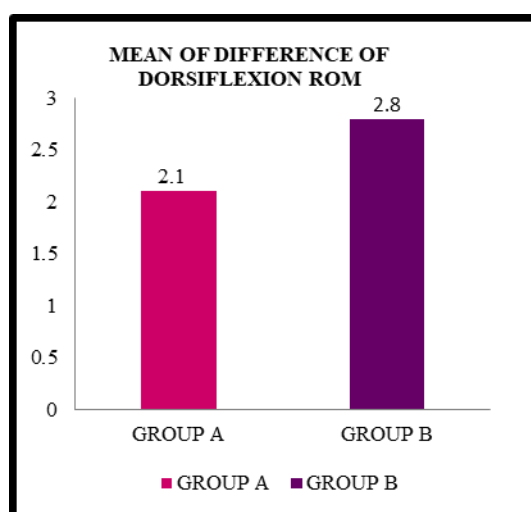
Graph 5: Between group analysis of NPRS

Between The Group Analysis Of Rom For Dorsiflexion:

Table 9: Showing the mean of differences of group A & B: (unpaired t-test values)

	Mean	SD	t- value	'p'- value
GROUP-A	2.10	0.57	2.6047	<0.0005
GROUP-B	2.80	0.63		

The 't' value of ROM FOR DORSIFLEXION between the groups is **2.6047** and considered statistically significant (**p < 0.0005**)



Graph 6: Between group analysis of Dorsiflexion ROM

V. RESULTS

The statistical analysis is done with a paired "t" test within group A analysis shows the significance of ($p < 0.0005$). The statistical analysis is done with a paired "t" test within group B analysis shows the significance (p

< 0.0005). Within the group analysis, it has been shown that the pre and post-test values of WBLT and NPRS and ROM FOR DORSIFLEXION show more significant improvement in Group B than Group A. The statistical analysis done using an unpaired 't' test with the post test values of Group A and Group B shows a significance of ($p < 0.0005$). Between the

group analysis of post values shows that Group B is more significant than group A. The statistical analysis, it shows that there is reduction of tightness, Pain and increased ROM in group B (PNF Stretching) than the group A (Neurodynamic sliding technique) which shows that group B is significant than the group A. Therefore, it has been concluded that the group B shows significant improvement in Flexibility, ROM and reduction of pain in Bus drivers.

VI. DISCUSSION

PNF is an advanced method of stretch training to increase flexibility. PNF is a type of stretching that alternates periods of static stretching with periods of isometric activation. The most commonly used PNF technique is "CONTRACT RELAX" technique. Aslesha Sirari et.al, evaluated the technique in this study where the tightened calf muscle is placed into a Passive stretching, so the muscle is activated isometrically and then the calf muscle is stretched further⁷.

Bradley PS et.al, evaluated that PNF Stretching increases muscular inhibition, it improves strength performance in contrast to other forms of stretching. Aarti Panchal et.al, evaluated that PNF stretching is more effective to improve calf flexibility compared to static stretching.

Neurodynamic encompasses interaction between mechanics and physiology of the nervous system. Providing movement or stretching could lead to changes in the neurodynamic and modification of sensation and increase in flexibility. Fiona Miranda et.al, evaluated that neurodynamic sliding shows the individual effect on improving the flexibility of a muscle⁸.

Ju-hyeon Jung et.al, evaluated that neurodynamic technique on the tibial nerve is an effective intervention that can improve lower extremity pain and ROM by promoting neural mobility and improving the pressure of surrounding nerve tissues.

VII. CONCLUSION

From the above result and discussion, the study concluded that PNF Stretching (GROUP B) is Effective in increasing the dorsiflexion ROM and reducing the calf muscle tightness & pain among bus drivers when compared with Neurodynamic sliding technique (GROUP A) on bus drivers after 6 weeks of intervention.

VIII. LIMITATIONS AND RECOMMENDATIONS

The limitation of this study is that only bus drivers have been taken this study and the sample size is small were small. Further study can be done with heavy duty drivers, tourist and car drivers including assessment for posture related to predisposition factor to calf tightness and low back ache. Proximal muscle group and superficial back line can also be assessed in future studies.

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