



## TO STUDY "EFFECTIVENESS OF BALANCE TRAINING EXERCISE AND PNF EXERCISE VERSUS ONLY BALANCE TRAINING EXERCISE IN PATIENTS WITH DIABETIC PERIPHERAL NEUROPATHY".

**Dr. Aditya Waje**

Assistant Professor Occupational Therapy Department Occupational Therapy Training School & Centre, Seth G. S. Medical College And General Hospital, Parel, Mumbai- 22.

**Dr. Jayashri Kale\***

Head Of Department , Occupational Therapy School And Centre ,Seth G S Medical College , KEM Hospital ,Parel,Mumbai. \*Corresponding Author

**ABSTRACT** **Background-** Diabetic peripheral neuropathy (DPN) is a common complication and quality-of-life damaging factor in diabetic patients. Some exercise interventions with balance and muscle strengthening components have been shown to reduce falls it is not known which elements or a combination of elements, of exercise interventions are most effective for improving balance in Diabetic peripheral neuropathy.

**Objective –** To compare the improvement in balance with balance training exercise versus Proprioceptive Neuromuscular Facilitation exercise & balance training exercise

**Method-** Subject was screened using the Michigan Neuropathy Screening Instrument. Forty (40) individuals of both the sexes in the age group of 40-60 years were included & randomly allocated in two groups ( Control & Experiment). Each participant underwent a clinical evaluation on Berg Balance Scale (BBS) at 1st day, 4th week and at 8th week. Exercises were performed daily for 8 weeks under supervision of therapist and advised at home. Each exercise session lasted for 45mins to 60mins.

**Result –** Balance was significant to improve by balance training exercise group but the combined effect of PNF exercise and balance training appeared to have a greater effect on balance control.

**Conclusion –** PNF exercises should be emphasized along with balance training exercises in the daily exercise regime of diabetic peripheral neuropathy subjects to improve their mobility and functional status.

**KEYWORDS :** Diabetic Peripheral Neuropathy, Balance Exercises, PNF Exercises

### INTRODUCTION:

Diabetic Mellitus is a group of metabolic diseases characterized by hyper glycaemia that results from defects in insulin secretion, insulin action on target tissue or both. According to World Health Organization (WHO), the prevalence of diabetes in 2010 was 5.6% in urban areas and 2.7% in rural areas of India. It is estimated that the total number of people with diabetes in 2010 was around 50.8 million, and is expected to rise to 87.0 million by 2030 . one of the largest global public health emergencies of the 21st century. Diabetic peripheral neuropathy (DPN) is a common complication and quality-of-life damaging factor in diabetic patients. About one-third of persons with DM have peripheral neuropathy. Many people with long standing diabetes have significant deficits in sensations such as tactile sensitivity, vibration sense, lower limb proprioception, and kinesthesia.

Patient with diabetic peripheral neuropathy demonstrates sensory motor affected resulting in a decrease the balance leading to increasing the risk of fall. Commonly lead to injury, loss of independence, associated illness and early death. Although some exercise interventions with balance and muscle strengthening components have been shown to reduce falls it is not known which elements or a combination of elements, of exercise interventions are most effective for improving balance in Diabetic peripheral neuropathy.

Proprioceptive Neuromuscular Facilitation (PNF) exercises are very similar to the actions and movements found in various activities of daily life PNF is one such technique that aims to increase strength, coordination, PNF Resistance training may increase the power generation of the major muscle groups of the lower extremity during walking in diabetic peripheral neuropathy patients . PNF Exercise can potentially strengthen the atrophied muscles in persons with diabetic peripheral neuropathy, particularly the ankle dorsal/plantar flexors and extensors/flexors.

### NEED OF THE STUDY–

Balance training exercise shows a beneficial effect on balance in Diabetic peripheral neuropathy. In previous studies; while researcher has demonstrated the effects of the PNF Improves Balance and Knee Extensors Strength of Older Fallers those experienced by individuals with Diabetic Peripheral Neuropathy. No one has directly examined it with individuals of Diabetic peripheral neuropathy.so in this study PNF were used along with balance training to see whether they are effective in balance. There was no such study that shown combined effects of both. So this study will examine the effectiveness of balance

training with PNF exercises on balance component in diabetic peripheral neuropathy patients.

However, it was not possible to affirm properly that PNF implies in higher effects than other exercises methods since no comparisons were conducted. This was one of the limitations of the study which needs to be investigated further. Also, there is no study which investigates the relationship between exercise methods and the systems involved in reinforcing balance.

Therefore the rationale behind this study is to evaluate the combining effects of balance training exercise and PNF exercise versus balance training exercises in diabetic neuropathy patients.

The present study will attempt to assess the improvement in balance with combined balance training exercise and PNF exercise in patients with Diabetic peripheral neuropathy.

### AIM:

To study the effectiveness of balance training exercise and Proprioceptive Neuromuscular Facilitation versus balance training exercise in diabetic peripheral neuropathy.

### OBJECTIVES:

To compare the improvement in balance with balance training exercise versus Proprioceptive Neuromuscular Facilitation exercise & balance training exercise.

### METHODOLOGY:

**Study Design:** Prospective, randomized, clinical trial. Sample size 40, both male and female in the age group of 40-60 years was included in the study. The subjects were randomly allocated into two groups;The Ethical approval was obtained from Institutional Ethics Committee for research on human subjects (ECHR).The informed consent was taken from all the subjects who participated in the study. Subjects were screened from the outpatient department as per as the inclusion criteria.All patients followed up with the therapist regularly twice a week for 30 mints session Group I: 20 subjects (Balance and PNF exercises) and Group II; 20 subjects (Balance exercises).Out of 40 healthy individuals 40 participated in the study for 8 weeks.each for a duration of 8 weeks. Each participant underwent a clinical evaluation on Berg balance scale (BBS) at 1st day,4th week, and at 8th week.

### Inclusion Criteria

Patients of 40-60years of age with Diabetes Mellitus (type I & II) more

than 4 years with controlled hypertension. HbA1c level greater than 7 %.(for more than 4year).Score higher than 7 out of 15 in the Michigan neuropathy questionnaire scale & examination score higher than 2.5.

**Exclusion Criteria**

Patients with evidence of significant CNS dysfunctions, musculoskeletal deformity, vestibular dysfunction, ., internal ear infections, complete sensory loss, hypoglycemic, angina & lower extremity arthritis or pain that limits standing or weight bearing were excluded.

**Study Procedure**

All 40 patients were explained in detail about the study procedure . The Informed Consent was taken from each patient participating in study. Subject was evaluated using the Michigan Neuropathy Screening Instrument (screening tool) . Berg Balance Scale: to determine balance and risk of fall. All patients followed up with the therapist regularly twice a week for 30 mints session each for a duration of 8 weeks. Each participant underwent a clinical evaluation on Berg balance scale (BBS) at 1st day,4th week, and at 8th week.. Berg balance scale is an objective measure of static and dynamic balance abilities. Consist of 14 functional task commonly performed in everyday life.

**OCCUPATIONAL THERAPY INTERVENTION**

Therapy for Group A & B All exercises were first demonstrated by the therapist. The exercise was divided in to two phases of four weeks each. Gradation of the exercise was increased after phase I. Warm up exercise were given for 5-10 minutes prior to main course of therapy in order to prepare the target muscle.

In **Phase I** (for initial 4 week) - Static quadriceps, ankle press. Bilateral lower limb all joint Active ROM exercise.( hip flexion, extension, abduction, adduction., knee flexion and knee extension, ankle dorsiflexion, plantar flexion.) . Bipedal inversion and eversion in this exercise ,the subject's center of mass is shifted laterally as subjects strengthened ankle invertors and avverters via closed chin exercises. if required support is taken. Intrinsic muscle of foot strengthening.(beads transfer with finger)

In **Phase II** (from 4 to 8 week) following exercises were given: Step up on stability trainer Lounges on stability trainer. Bipedal toe and heel raises on stability trainer .using support if required. Marching on foam mattress.Single leg standing on foam mattress .Standing in tandem position ,while gradually increasing the period of performance on foam mattress. Tandem Walking on foam matters {1 sets of 10 repetitions of each exercise }

Intervention for Group A - Experimental group A (PNF TECHNIQUES) Diagonal movement patterns of lower extremity and Strengthening techniques - Rhythmic initiation, dynamic reversion, Isotonic combination, rhythmic stabilization. These strengthening techniques can be incorporated in PNF diagonal patterns. 3 set perform each set interval between 5 sec rest period .5 rep/set, gradually increase the repetition according to patient level. Same therapist will be conducting all training session according to PNF principles.

**RESULTS AND DATA ANALYSIS:**

Represents statistical analysis of pre-therapy and post therapy difference in mean scores of individual groups.

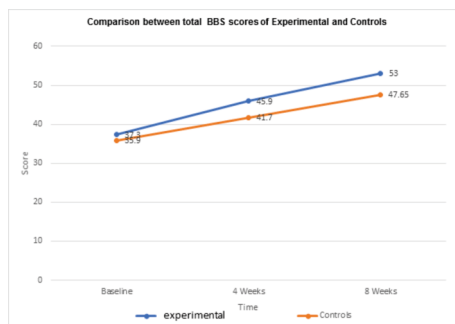
GROUPS	Mean pre	Mean post	Std .deviation pre	Std, deviation post	p-value (significance < 0.05)
Experimental	37.3	53.0	3.63	2.57	0.000
Control	35.9	47.65	3.66	4.71	0.001

- Wilcoxon test was performed in group A and group B after 8 weeks of respective training protocol . Results showed statistical very highly significant improvement in berg balance scale among diabetic neuropathy patients(p value < 0.001). indeed mean score rating also improved from 37.3 to 53.0 in experimental group and 35.9 to 47.65 in control group
- **Comparison between total BBS scores of Experimental and Controls group.** represents the statistical analysis of post-therapy mean scores of BBS scale of baseline, 4th week and 8th week in experimental (balance training plus PNF training) and control group(only balance training) using Mann Whitney U test

	Experimental (n-20) BBS Score	Controls (n-20) BBS Score	p-Value *	Interpretation
Base line	37.3 ± 3.63	35.9 ± 3.66	0.289	Accept Null hypothesis
4 Weeks	45.9 ± 3.93	41.7 ± 3.10	0.01	Reject Null Hypothesis
8 Weeks	53.0 ± 2.51	47.65 ± 4.71	0.01	Reject Null Hypothesis

\*- Mann Whitney U Test

- Mann whitney U Test perform between the experimental and control group on 4th week, 8th week respective training protocol showed statistically significant improvement in Berg Balance score among Diabetic peripheral neuropathy patient (p=0.01)



**DISCUSSION:**

Our finding for BBS for group A and group B level: Positive effects of respective intervention was observed in both experimental group A and control group B on static and dynamic balance as observed in 4th week p value is 0.01 hence the accepted within level of significance. The result indicate that experimental group A shows more improvement from baseline to 8th week. In consistence with all the related studies we found similar results. our findings revealed that PNF pulse balance training was more effective than balance training alone in improving balance in diabetic peripheral neuropathy patients (p value was 0.01). our other findings also revealed that significant improvement was observed in both group post intervention. (p value is <0.05).

Form all study the improvement seen static and dynamic balance in diabetic peripheral neuropathy patients might can be because of , proprioceptive training which led to increase in proprioceptive firing from the cutaneous receptors. It is also accountable that the new and augmented feedback might have enhanced motor learning which can also have an effect on the balance. Finally, proprioceptive training can be used as a simple and cost-effective treatment program in improving functional balance in diabetic neuropathic patients. This may help the patient to improve their quality of life by reducing the risk of falls. Also, the movements in PNF are executed in diagonal pattern that is parallel to muscular topography, which reproduces physiological movements, as gait. It was also suggested that higher balance agonist and antagonist muscle activation is achieved after PNF exercise reducing co activation.

Additional finding of our study ,which gives the individual components median score of BBS scale in both group at the base line ,4th week and 8th week. These median score reflects that experimental group should improvement in both static as well as dynamic balance component (i.e. majority of participant had reached maximum score of 4);where as in control group participant had reaches score of 4 in static balance component had not in dynamic balance component.

These results indicate that balance was significant improve by balance training exercise group but the combined effect of PNF exercise and balance training appeared to have greatest effect on balance control, this supports our alternate hypothesis .In addition to this ,the therapeutic intervention in this study is cost effective and safe and therefore can be recommended for subjects with balance problems.

**CONCLUSION:**

Conclusion of my study is, there was a significant improvement in the balance in both the group but the group treated with PNF training exercise along with balance training exercise show higher improvement. So PNF training plus balance training would be desirable to be incorporated in the daily exercise regimen of diabetic peripheral neuropathy patients to improve their mobility and

functional status. This kind of techniques would render a better in a short time and offer improvements in the quality of ADLs and tasks in daily chores and routines.

#### LIMITATIONS:

1. The study was conducted on a small sample size.
2. Specific ADL scale was not used to assess.
3. HBA1c level post-intervention could not be assessed as the patient did not follow up after 8 weeks. So the effect of exercise on their glycemic index (HBA1C) could be not be commented.

#### RECOMMENDATIONS:

- Long term effectiveness of combined PNF training and balance training on ADL in patients with diabetic neuropathy should be tested.
- Longitudinal, multi-centre study with a large sample size should be considered.

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