

# Immediate Effect of Rhythmic Stabilization Technique versus Stabilizing Reversal Technique on Static Standing Balance in Institutionalized Elderly.

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**ABSTRACT:** This study aimed to investigate the effect of Proprioceptive Neuromuscular Facilitation (PNF) techniques on static standing balance in institutionalized elderly and to find out if they can be used to improve balance and determine which one of these techniques is better. 32 institutionalized elderly participated in the study and were divided equally using even-odd method in each group. The outcome measure was one-leg stance time. An intervention consisting of the Rhythmic Stabilization technique and Stabilizing Reversal technique was performed on groups A and group B, respectively. The results showed that there was a statistically significant improvement in one-leg stance time post-intervention of the rhythmic stabilization technique as well as the stabilizing reversals technique. Furthermore, the study's findings indicated that the rhythmic stabilization group outperformed the stabilizing reversal group in terms of their improvement in one-leg stance time.

**Keywords:** Proprioceptive neuromuscular facilitation, Institutionalized, Rhythmic stabilization, stabilizing reversals, One-leg stance time.

## I. INTRODUCTION:

Balance is the ability to maintain the center of gravity in the base of support and maintain posture through interactions with the environment while moving the body<sup>[1]</sup>. It is a prerequisite for functional competence, as it is important to perform daily living activities independently. The geriatric population, classified as elderly (60-75 years), old (76 to 90 years), and very old (over 91 years), is a major part of our population, which presents various social, economic, and health-related issues. Common issues in the elderly population include limited mobility, falls, impaired cognition, urinary

incontinence, and falls<sup>[2]</sup>.The prevalence of balance impairments in older adults ranges from 20% to 50%<sup>[3]</sup>.Muscle strength and balance are strongly correlated with biomechanical limitations with ageing, with postural imbalance being a major cause of aging-related biomechanical limits. Even healthy elderly people have challenges with static and dynamic posture control due to aging-related changes in the sensorimotor and neuromuscular systems. This makes them more susceptible to falls, as their bodies oscillate more even when standing upright<sup>[4]</sup>

Community-dwelling elderly and institutionalized elderly are two types of elderly populations. Community-dwelling people above the age of 65 have a fall rate of about 30% per year, while institutionalized people live in facilities at 50-66% annually. Gait/balance disorder is one of the specific conditions for the risk of falling, as elderly patients living in institutions often have limited opportunities to independently carry out tasks and daily living activities<sup>[5]</sup>.To restore balance, clinicians must facilitate trunk musculature, using exercises like trunk stabilization exercises, strengthening muscles around the ankle and range of motion for a joint, and strengthening exercises for the leg<sup>[6]</sup>.Proprioceptive neuromuscular facilitation (PNF) technique can be useful for these multi-joint muscle strengthening exercises<sup>[1]</sup>.

In proprioceptive neuromuscular facilitation (PNF), two stabilizing exercise techniques are classically suggested, called stabilizing reversal (SR) and rhythmic stabilization (RS)<sup>[7]</sup>. While stabilizing reversal is an alternating isotonic method against resistance, rhythmic stabilization is an alternating isometric technique with no motion permitted<sup>[6]</sup>.

## II. MATERIALS AND METHODOLOGY:

This experimental study focuses on the impact of proprioceptive neuromuscular facilitation techniques on one-leg stance time in individuals aged 60-74 years. The study uses a convenient sampling method. The study equipment included a chair and a stopwatch. The inclusion criteria included institutionalized male and female subjects, with a leg stance time of less than 10 seconds. Exclusion criteria included neurological conditions, acute injuries, balance issues due to visual impairments, and unwillingness to participate.

Ethical approval was obtained, and informed consent was taken from subjects. They were divided into two groups of 16 each (A and B) based on the even and odd method. The one-leg stand time was recorded pre-intervention. Group A underwent the Rhythmic Stabilization technique, while Group B underwent the Stabilizing Reversal technique. For group A, the patient's trunk flexor muscles were resisted with an isometric contraction. The command given was 'Maintain the same position and try to match my resistance in front.' The resistance was changed to resist trunk extension. The procedure was repeated with reversed directions. For group B, the patient was taken in a sitting position, and resistance was given to the patient's trunk flexor muscles. The command given was "Do not let me push you back." The and was then moved to resist the extension of the trunk that was resisting trunk flexion. The procedure was repeated with reversed directions.

A protocol was set with 3 sets of 8 repetitions in each set, with a 10-second resistance duration and a 30-second rest interval between each repetition. A 60-second rest interval was given between each set. The one-leg stand time was recorded post-intervention, and the data was subjected to statistical analysis<sup>[8]</sup>.

## III. RESULTS:

Normality test was done using Shapiro-Wilk Test. The study used a non-parametric test for data analysis, as the data set was not normally distributed (p value<0.05).

The gender distribution of the rhythmic stabilization group had 5 males and 11 females, whereas the stabilizing reversal group was 10 males and 6 females.

For comparison of pre-test and post-test scores in Rhythmic Stabilization group paired sample Wilcoxon test was done. According to this study, there was a significant difference in the pre-

post values of one leg stance time for each subject in the rhythmic stabilization group. The mean value indicated changes in post treatment and higher values were recorded for post treatment outcome and the standard deviation shows limited consistency with post-treatment value which is more than pre value. The effect size or Cohen's D indicates a 1.65 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at a 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with a p-value less than the 5% significance level(i.e.  $0.001 < 0.05$ ) in the study and therefore it justifies the improvements in health outcome post-intervention.

For comparison of pre-test and post-test scores in Stabilizing Reversal group paired sample Wilcoxon test was done. There was a significant difference in the pre-post values of one leg stance time of each subject in the stabilizing reversal group. The mean value in the Stabilizing reversal group indicated changes post treatment and higher values were recorded for post treatment outcome and also the standard deviation shows limited consistency with post treatment value which is more than pre value. The effect size or Cohen's D indicates a 2.58 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at a 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with a p-value is less than a 5% significance level(i.e.  $0.001 < 0.05$ ) in the study and therefore it justifies the improvements in health outcome post-intervention.

To find out which of the two techniques is more effective, an independent test for group statistics was performed using independent samples Mann Whitney Test. It was observed that between groups analysis it is significant for difference frame at a 5% level significance as the p-value is less than a 5%. It shows significant differences between the groups. Thus, the Rhythmic stabilization technique is better than the Stabilizing reversal technique on the basis of a higher mean difference value.

## IV. DISCUSSION:

The study aimed to determine the effectiveness of rhythmic stabilization and stabilizing reversal techniques in improving static standing balance in the elderly population. The results showed that both techniques are effective,

with rhythmic stabilization being more effective than stabilizing reversal.

The elderly population must be able to react appropriately and successfully regain equilibrium following unplanned disruptions to prevent falls. Traditional balance training involves strength training and external disruptions, but attempting to execute moves may cause fear of falling. Proprioceptive Neuromuscular Facilitation (PNF) method focuses on increasing muscle response to cortical stimulation in static positions, reducing the risk of falls during training<sup>[9]</sup>.

Both methods are based on principles of joint approximation and resistance combined with continuous verbal instruction. Active muscle tension is useful proprioceptive facilitation that can expand proximally and distally and vice versa, encouraging co-contraction and enhancing postural control and balance.<sup>[9]</sup> Reliable neurophysiological and kinesiological concepts and clinical experience form the foundation of PNF, which helps in evaluating and improving a patient's strength, endurance, movement patterns, and postural reactions<sup>[10]</sup>.

Rhythmic stabilization involves isometric contractions against the resistance provided by the therapist, while stabilizing reversal involves alternating isotonic contractions opposed by resistance to prevent motion<sup>[11]</sup>.

A similar study conducted by Jessica da Silva Lamp et al found a reduction in Time Up and Go time and an increase in Functional Reach Test range in Rhythmic stabilization and Stabilizing reversal groups. Stabilometry analysis showed a significant difference only for the rhythmic stabilization group, with a reduced average velocity of the center of pressure (COP) and an increase in left foot pressure<sup>[9]</sup>. A study by Phan The Nguyen et al found that proprioceptive neuromuscular facilitation-based physical therapy has statistical effects on balance and gait speed in individuals with a chronic stroke at least 6 months after stroke. The study suggests that proprioceptive neuromuscular facilitation may help with core muscular control, raising balance capacity by promoting proprioceptive awareness of muscles and tendons and increasing balance through coordinating movement<sup>[12]</sup>.

A study by Saloni J Soni et al found that core stability-focused neuromuscular training dramatically raised composite Y balance test scores in young, healthy people. The study suggested that proprioceptive neuromuscular facilitation likely functioned by facilitating the neuromuscular process, allowing for the use of facilitating

strategies in addition to resistance to achieve a higher motor response<sup>[13]</sup>.

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