# EFFECT OF MATRIX RHYTHM THERAPY ON PAIN, BALANCE IN DIABETIC PERIPHERAL NEUROPATHY

**--A Pilot study**

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**Abstract**

Diabetic peripheral neuropathy (DPN) is the most common complication following diabetes mellitus. DPN may impair the quality of life by affecting the balance and gait in longstanding diabetic individuals. Falls are becoming more common in DPN. The treatment of DPN is much limited. Physiotherapy focuses on reducing pain through the application of electrical stimulation and improving balance and gait through exercises. There is no substantial evidence available in physiotherapy management. Matrix rhythm therapy (MaRhyThe) is new innovative equipment commonly used to manage pain and improve functions in various musculoskeletal and neurological conditions. This study aimed to identify matrix rhythm therapy's effect on pain and balance in diabetic peripheral neuropathy. A pilot study was conducted at the Department of Diabetology, Supreme Ortho Hospital, and Outpatient department, JKK Munnirajah Medical research foundation college of Physiotherapy, Komarapalayam, Namakkal. Convenience sampling was used to recruit ten participants with diabetes and suffering from DPN. They were all treated with MaRhyThe treatment was for 45 mins as per the protocols designed by Dr Ulrich, who advised lower limb range of motion exercises to all the participants for 10 minutes. The study was conducted for six weeks, and all the participants took treatment once a week with MaRhyThe. The outcome measures selected in this study were pain and balance. A numerical pain rating scale is used to evaluate pain, and the Time up and go test, and functional reach test are used to assess balance. Results were computed using SPSS 24.0, with a level of significance of 0.05%. Wilcoxon rank-sum test was used to analyze the data and found that the Z test for NPR is 2.803 (p=0.005), TUG is 3.097 (p=0.0019), and FRT is 2.768 (p=0.0056). This study identifies that MaRhyThe substantially reduces pain and improves balance in diabetic peripheral neuropathy.

**Keywords :**Diabetic Peripheral neuropathy, Matrix rhythm therapy, Pain, Balance, Time up and go test, Functional reach test

**DOI Number: 10.48047/nq.2022.20.19.NQ99039** **NeuroQuantology2022; 20(19):436-443**

**Introduction**

Diabetic Peripheral neuropathy (DPN) affects up to 50% of type 1 and type 2 diabetes mellitus (Shiferaw et al., 2020). DPN predominantly affects the sensory system which affects the daily functions of the individuals. Kumar et al., 2012, have claimed that the common symptoms of DPN are pain, numbness, and tingling sensation, including balance deficits. It affects the motor neurons, sensory neurons, and autonomic nervous systems. DPN is the beginning reason for the development of diabetic foot ulcerations (Singh et al., 2005), and one of the common causes of non-traumatic lower-limb amputations (Boulton et al., 2018).

Pop-Busui and his colleagues stated that around 75% of DPN are distal symmetric polyneuropathy. Hicks and Selvin 2019 stated that DPN affects the small or large nerve fibres, which cause neuropathic pain in 10%—30% of individuals. The pain may be described as burning, stabbing, hypesthesia, or deep ache. Usually, worsen at the night and affects the lower limbs and feet (Boulton et al., 2005).

Selvarajah et al., in 2019, identified that DPN is the major cause of balance impairment. He also added that balance impairment alters the gait with neuropathic pain, it is often unresponsive to multiple therapies. Neuropathic pain with the reduction in the sensation in the peripheral areas contributes to an array of poor outcomes like falls, impairment in the quality of life, restrictions in the activities of daily living, and psychological disorders (Vileikyte et al., 2005). It causes an altered sensation, deficits in proprioception, reduced reflexes, and strength in the lower extremities, which compromise balance (Ites et al., 2011).

Balance deficits are more predominant in DPN, and poor balance affects the quality of life (Brown et al., 2015). Falls lead to a decline in mobility, avoidance of activity, bedridden, and mortality (Hewston et al., 2016). It was identified that sensory, motor and cognitive contributions increase the fear of falls, contributing to falling risk. Fear of falls may pronounce due to lower limb muscle weakness, impaired balance, impaired coordination, and gait (Riandini et al., 2020, Kelly et al., 2013).



Smith and colleagues in 2006, explained that the management of DPN focuses primarily on glycaemic control with lifestyle modifications, physical activities, and a balanced diet playing an essential role in glycaemic control. Standard care includes pharmacological interventions, topical creams, and exercises. Physiotherapy management includes electrical stimulations and low-level laser therapy for pain reduction (Hamza et al., 2000).

Matrix Rhythm Therapy (MaRhyThe) is a treatment developed by Dr Ulrich G. Randoll in Germany; developed this concept based on clinically oriented fundamental research, which Dr Randoll carries out at the University of Erlangen, Germany (Randoll 2001). MaRhyThe is very useful in handling various conditions. It plays a role in the improvement of microcirculation of the muscles and nerves (Bhatikar 2018).

Naik in 2020 concluded that MaRhyThe is a safe, non-invasive

treatment that reduces pain and improves mobility in the joint. Works of literature found that MaRhyThe is very effective in diabetes; it also shows an increase in microcirculation, which helps maintain the pH of the extracellular fluids and reduces acidosis. It also enhances the regeneration of the nervous tissues and improves the nerves' sensation and nerve tissue elasticity.

MaRhyThe is a new concept in India; the application of this over DPN is limited. There are many kinds of literature on MaRhyThe effect on diabetes (Naik et al., 2020, Randoll 2001). The strong hypothesis stated that MaRhyThe is much more effective in reducing neuropathic pain. Based on this hypothesis, this study aimed to identify the effect of matrix rhythm therapy on pain and balance in Diabetic peripheral neuropathy.

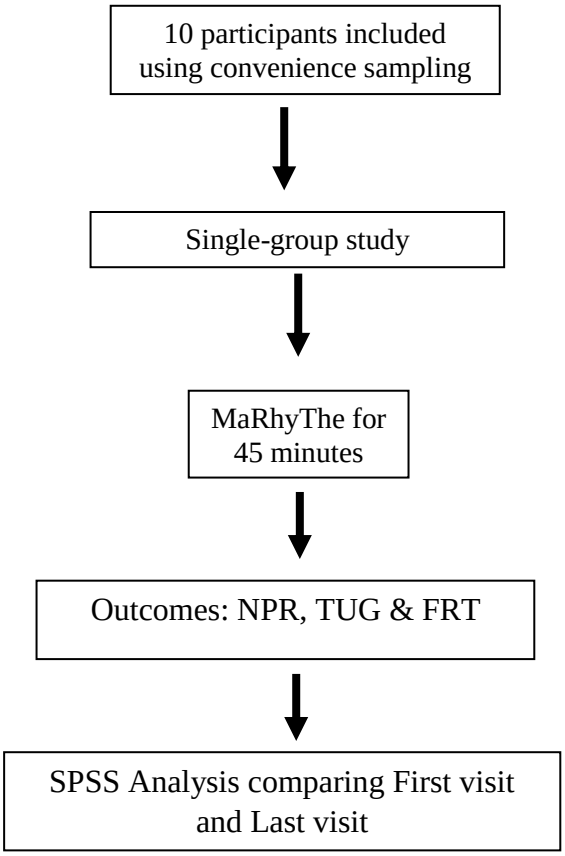
**Methodology:**

A pilot study was conducted at the Department of Diabetology, Supreme Ortho Hospital and Outpatient department (OPD), JKK Munnirajah Medical research foundation college of Physiotherapy, Komarapalayam, Namakkal. Convenience sampling was used to recruit participants for this study. All the participants who visited the Department of Diabetology, Supreme ortho hospital were monitored for their blood sugar levels, conducted sensory testing of the lower limbs, motor assessment, and balance evaluation. Only ten patients were selected for this study using the predetermined inclusion criteria, which are the age of participants are above 50 years, participants suffering from type II diabetes mellitus, uncontrolled diabetes with RBS levels of above 250, HBA1c level of above 7%, Berg balance score of less than 50, positive monofilament test in the foot, complains of numbness, and tingling sensation in the foot for nearly about three months. The exclusion criteria are those with comorbidity, including hypertension, cardiac abnormalities, higher centre involvement, foot ulcers, poor balance, bilateral or unilateral lower limb muscle weakness, and alcoholic individuals.



The study obtained ethical approval from Madhav University, Rajasthan, India. The study was detailed to every selected participant, and their concern was received in writing. All ten participants were given MaRhyThe treatment for 45 mins as per the protocols designed by Dr Ulrich. Lower limb range of motion exercises was advised to all the participants for 10 minutes. Balance exercises like single-leg standing for 10 mins, tandem walking and heel, and toe walking were prescribed as home advice. This study was conducted for six weeks, and all the participants took treatment once a week, a total of six sessions of MaRhyThe were applied to every participant. The outcome measures selected in this study were Pain and balance. A numerical pain rating scale is used to evaluate Pain and Time up and go test, and functional reach tests are used to assess balance. Both these tools have high reliability and validity.

**Figure I: Flow Chart**






The trained Matrix rhythm therapy applied MaRhyThe. The participants' position in supine lying. The resonator of MaRhyThe is placed over the leg, which coherently delivers the mechanical, magnetic oscillations in the physiological frequencies (8—12 Hz) to the skeleton musculatures and the nervous systems. This normalizes the cellular rhythm as well as the nutrient flux density in the extracellular matrix. One session of 45–60 min was given per participant every week. The study collected the parameters from first visit and the last visit.

**Result:**

Collected data were assessed using SPSS 24.0 with non-parametric tests. Wilcoxon rank-sum test was used to analyses the data with the significance levels of $\alpha < 0.05$. Data analysis was shown in Table I.

**Table I**

**Data analysis on Outcome measures**

| Outcome Measures | N | MaRhyThe | | Percentage of Change | Cohen's d value | p value | Z test |
|---|---|---|---|---|---|---|---|
| | | Pre test | Post test | | | | |
| **NPR** | 10 | 5.5 ± 0.85 | 1.6 ± 0.69 | 70.91 | 5.011 | 0.0051 | 2.8031 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **TUG** | 10 | 10.96 ± 0.82 | 69.74 ± 0.72 | 36.45 | 5.143 | 0.0019 | 3.097 |
| **FRT** | 10 | 17.5 ± 1.08 | 27.6 ± 2.59 | 57.71 | 5.088 | 0.0056 | 2.768 |

Comparing the Pre- and Post-intervention, it was noted that there is a significant improvement within the groups. The observed size is more excellent in all the outcomes, indicating a difference between the average and μ0. This signifies that p-value < α, H0 is rejected. Based on the statistical analysis, this study identifies a substantial change between the average is μ0 significant, which means there is a considerable difference between the pre and post interventions.

**Discussion**

This study aimed to identify matrix rhythm therapy's effect on pain and balance in diabetic peripheral neuropathy. Jahantigh et al, in 2020, stated that diabetes is becoming a public health problem; it associates with microvascular complaints, which lead to neuropathies. Recent studies have identified that poor glycaemic levels, long duration of diabetes, elevated albumin levels, and obesity are prevalent for DPN development (Tesfaye and Selvarajah 2012).

Diabetic patients have a five times greater number of falls when compared with non-diabetic (Roman de Mettelinge et al., 2013). This may be due to impaired proprioception in the lower limbs, weakness of the muscles, poor vision, and vestibular involvement. The fall consequences noted are a decline in mobility, avoidance of activities, institutionalizations, and mortality (Hewston and Deshpande, 2016). The management of the DPN varies from exercises to electrical currents; however, there is no optimal treatment identified. The patient has difficulty in balance and needs a complete set of exercises to overcome the balance disorders.



MaRhyThe was a recent innovation that did not utilize in the management of DPN. The studies done on deep foot ulcers by Bhatikar 2018, found that having a significant role. Studies also identified that the application of the MaRhyThe encourages cellular metabolisms and aids in the reactivation of the tissues. The in-depth effective rhythmical micro extensions enhance the metabolic process, which improves circulation in part, the increased oxygen supply in the lower limbs, and ATP production to normalize the blood pH. The application of MaRhyThe also enhances the relaxation of the muscle fibres, relieving complications following diabetes (Randoll 2009).

Previous studies by Maruthy in 2019, and Taspinar in 2013 have identified that the application of the MaRhyThe increases blood circulation to the affected tissue by 35%, as the blood circulation increases, there is the removal of the metabolic by-products and other biochemicals located in removed, and

thereby maintaining the normal pH and normalize the cellular metabolisms which help in pain reductions (Shrivastava 2015).

MaRhyThe improves the oxygen supply by improving the microcirculation around the affected tissues. It produces the relaxation of the tissues, muscles, and fasciae. This relaxation remains for a longer duration, maintains the metabolic process at cellular levels, and regulates the oxygen supply to the cells. This process facilitates pain reduction (Shrivastava 2015).

MaRhyThe has lasting effects on the cell matrix, which include intracellular and extracellular levels. Application of this produces a simultaneous stimulation of the pump suction effect and a physiological stimulation of the neuron receptors. The restoration of the nervous system functions through the metabolic process that occurs between the cells and the extracellular matrix (Jager 2008).

The study's strength is that this study evaluates to identify the effect of MaRhyThe on DPN; the studies related to this are very few. This study identifies the impact of MaRhyThe on pain and balance, whereas fewer studies are comparing these two parameters. Two scales were used to assess balance so that the reliability of the study was increased. This study's weaknesses are that the study involves the selected patient with DPN and convenience sampling. The associations between the parameters are not identified. The association of glycaemic control and the DPN concerning the outcome measures is not studied. The balance impairment is the main aim of the study, whereas the other parameters are not investigated.

This study concludes that MaRhyThe produces a significant improvement in pain and balance. This study supports that the MaRhyThe substantially reduces the pain and improves the balance in diabetic peripheral neuropathy.

**Acknowledgment**: The authors would like to thank the Management, Principal, and All Faculties of JKKMMRF College of Physiotherapy, Komarapalayam, Namakkal, India, for their logistic and technical support in conducting this study.



**Authors Contributions:** Conceived and designed the experiments: Anantharaj. Performed the experiments: Anantharaj, Vishnupriya. Analyzed the data: Dr Arunachalam &Dr. Anand V. Contributed reagents/materials/analysis tools: Anantharaj, Dr.Arunachalam, & Dr. Anand V. Wrote the paper: Dr. Anand V, Anantharaj&Vishnupriya.

**Conflict of Interest:** The authors declare no conflict of interest

**References**

1) Bhatikar,K.(2018). Effect of Matrix Rhythm Therapy on Chronic Vein Dysfunction Deep Foot Ulcer: A Case Report. *J Yoga & Physio*.6(5): 555696.
2) Boulton, A.J., Vinik, A.I., Arezzo, J.C., Bril, V., Feldman, E.L., Freeman, R., et al. (2005). Diabetic neuropathies: a statement by the American Diabetes Association. Diabetes Care.28(4):956–962.
3) Boulton, A.J.M., Armstrong, D.G., Kirsner, R.S, et al., (2018).

Diagnosis and Management of Diabetic Foot Complications. Arlington (VA): American Diabetes Association.

4) Brown, S.J., Handsaker, J.C., Bowling, F.L., Boulton, A.J., &Reeves, N.D.(2015) Diabetic peripheral neuropathy compromises balance during daily activities. Diabetes Care. 38(6): 1116–22.
5) Hamza, M.A., White, P.F., Craig, W.F., Ghoname, E.S., Ahmed, H.E., &Proctor, T.J (2000) Percutaneous electrical nerve stimulation: a novel analgesic therapy for diabetic neuropathic pain. Diabetes Care 23:365 -370.
6) Hewston, P., &Deshpande, N. (2016). Falls and Balance Impairments in Older Adults with Type 2 Diabetes: Thinking Beyond Diabetic Peripheral Neuropathy. Can J Diabetes. 40(1):6–9.
7) Hicks, C.W., &Selvin, E. (2019).Epidemiology of Peripheral Neuropathy and Lower Extremity Disease in Diabetes. Curr Diab Rep. 19(10):86.
8) Ites, K.I., Anderson, E.J., Cahill, M.L., Kearney, J.A., Post, E.C., &Gilchrist,L.S.(2011) Balance interventions for diabetic peripheral neuropathy: a systematic review. J Geriatr Phys Ther. 34(3):109-16.
9) Jager, P.A., Chan, D.,&Muderrisoglu, H.F. (2008) Matrix rhythm therapy application to patient with back pain. Turk J Phys TherRehabil. 19:217- 21.
10) Jahantigh. Akbari, N., Hosseinifar, M., Naimi, S.S., Mikaili, S., &Rahbar, S. (2020). The efficacy of physiotherapy interventions in mitigating the symptoms and complications of diabetic peripheral neuropathy: A systematic review. *J Diabetes MetabDisord.*19(2):1995-2004.
11) Kelly, C., Fleischer, A., Yalla, S., Grewal, G.S., Albright, R., Berns, D., et al. (2013). Fear of falling is prevalent in older adults with diabetes mellitus but is unrelated to level of neuropathy. *J Am Podiatric Med Assoc*. 103:480–8.
12) Kumar, K.H., Kota, S., Basile, A.,&Modi, K (2012). Profile of microvascular disease in type 2 diabetes in a tertiary health care hospital in India. *Ann Med Health Sci Res*. 2(2):103–8.
13) Maruthy, T., Bindu, P.H., &Kauser, M.S. (2019). Effects of matrix rhythm therapy in patients with myofascial trigger points. *J Soc Indian Physiother*.3(2):27-9.
14) Naik, V., Khatri, C.B., &Ganesh,B.R.(2020). Effect of matrix rhythm therapy in diabetic foot ulcer healing: a case report. *Journal of contemporary medical sciences*. 6(4):187-190.
15) Pop-Busui, R., Boulton, A.J., Feldman, E.L., Bril, V., Freeman, R., Malik, R.A., et al. (2017). Diabetic Neuropathy: A Position Statement by the American Diabetes Association. *Diabetes Care*.40(1):136–154.

16) RandollU.G,,&Hennig F,F (1998). Muskelvibration, -kraft und Osteoporose*Abstr. Osteologie Supplement* 1 Bd. 7.
17) Randoll, U.G., &Hennig, F.G. (2009). Matrix-Rhythm-Therapy Cell-Biological Basics, Theory and Practice. *J PT Zeitschrift Fur Physiotherapeuten.* 61(6).
18) Riandini, T., Khoo, E.Y.H., Tai, B.C., Tavintharan, S., Phua, M.S.L.A., Chandran, K., Hwang, S.W.,&Venkataraman, K. (2020). Fall Risk and Balance Confidence in patients with Diabetic Peripheral Neuropathy: An Observational Study. *Front. Endocrinol*. 11:573804.
19) Roman de Mettelinge, T., Cambier, D., Calders, P. et al (2013). Understanding the relationship between type 2 diabetes mellitus and falls in older adults: a prospective cohort study. Bayer A, ed. *PLoS ONE*.8(6):e67055.
20) Selvarajah, D., Kar, D., Khunti, K., Davies, M. J., Scott, A. R., Walker, J., &Tesfaye, S. (2019). Diabetic peripheral neuropathy: advances in diagnosis and strategies for screening and early intervention. *The Lancet Diabetes & Endocrinology.* 7(12): 938—948.
21) Shiferaw, W.S., Akalu, T.Y., Work, Y., &Aynalem, Y.A. (2020). Prevalence of diabetic peripheral neuropathy in Africa: a systematic review and meta-analysis. *BMC EndocrDisord.*20**:** 49. https://doi.org/10.1186/s12902-020-0534-5
22) Shrivastava, S. (2015). Matrix rhythm therapy: a new dimension in pain management and restricted mobility -Birth injuries. *IJARES*.4(1):113—118.
23) Singh, N., Armstrong, D.G., &Lipsky, B.A.(2005) Preventing foot ulcers in patients with diabetes. *JAMA*.293: 217–28.
24) Smith, A.G., Russell, J., Feldman, E.L., Goldstein, J., Peltier, A., Smith, S., et al. (2006). Lifestyle intervention for pre-diabetic neuropathy. *Diabetes Care*. 29(6):1294–1299.
25) Taspinar, F., Aslan, U.B., Sabir, N., &Cavlak, U. (2013). Implementation of matrix rhythm therapy and conventional massage in young females and comparison of their acute effects on circulation. *J Altern Complement Med.* 19(10):826–32.
26) Tesfaye, S., &Selvarajah, D. (2012). Advances in the epidemiology, pathogenesis and management of diabetic peripheral neuropathy. *Diabetes Metab Res Rev*.28:8–14.
27) Vileikyte, L., Leventhal, H., Gonzalez, J.S., Peyrot, M., Rubin, R.R., Ulbrecht, J.S, et al. (2005). Diabetic peripheral neuropathy and depressive symptoms: the association revisited. *Diabetes Care.*28(10):2378–2383.