CLINICAL SCIENCE

THE EFFECT OF PHYSICAL THERAPY ON PAIN INTENSITY AND FUNCTIONAL STATUS IN PATIENTS WITH DIABETIC PERIPHERAL NEUROPATHY

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Citation: Spasovska-Gjorgovska A, Koevska V, Ristikj-Stomnaroska D. The effect of physical therapy on pain intensity and functional status in patients with diabetic peripheral neuropathy. Arch Pub Health 2026; 18 (2).

doi.org/10.3889/aph.2026.6888

Online First

Key words: diabetic peripheral neuropathy, kinesitherapy, Visual Analogue Scale, Timed Up and Go test.

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Received: 11-Aug-2026; **Revised:** 1-Nov-2026; **Accepted:** 4-Nov-2026; **Published:** 16-Nov-2026

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Competing Interests: The authors have declared no competing interests

Abstract

Aim of the study was to evaluate the effects of physical therapy on pain intensity and functional status in patients with diabetic peripheral neuropathy (DPN). Materials and Methods: The study was conducted at the Polyclinic Healthcare Institution, Ss. Cyril and Methodius University in Skopje. A total of 32 participants were included and divided into two groups: an experimental group (Group A, 15 participants) that received kinesitherapy (aerobic exercises and balance training) and electrotherapy (transcutaneous electrical nerve stimulation and galvanic current applied to the lower extremities) over a 15 day period, and a control group (Group B, 17 participants) that received only a kinesitherapy protocol. Patients were assessed at three time points: baseline (day 0, after 15 days, after 90 days). The Visual Analogue Scale (VAS) and the Timed Up and Go test were used for clinical evaluation. Results: The experimental group showed significant pain reduction ($p < 0.001$), with mean scores decreasing from 7.5 at baseline to 4.1 at day 15 and 2.3 at day 90. Functional mobility also improved, with mean TUG time decreasing from 10.6 to 8.2 and 7.8 seconds, respectively. Conclusion: Physical therapy involving both kinesitherapy and electrotherapy has a beneficial impact on pain reduction, functional status, and mobility in patients with DPN.

КЛИНИЧКИ ИСТРАЖУВАЊА

ЕФЕКТОТ НА ФИЗИКАЛНАТА ТЕРАПИЈА ВРЗ ЈАЧИНАТА НА БОЛКАТА И ФУНКЦИОНАЛНАТА СОСТОЈБА КАЈ ПАЦИЕНТИ СО ДИЈАБЕТИЧНА ПЕРИФЕРНА НЕВРОПАТИЈА

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Цитирање: Спасовска-Ѓорговска А, Коевска В, Ристиќ-Стомнароска Д. Ефектот на физикалната терапија врз јачината на болката и функционалната состојба кај пациенти со дијабетична периферна невропатија. Арх Ј Здравје 2026; 18 (2)

doi.org/10.3889/aph.2026.6888

Online First

Клучни зборови: дијабетична периферна невропатија, кинезитерапија, визуелна аналогна скала, Timed Up and Go test.

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Примено: 11-авг-2026; **Ревидирано:** 1-ное-2026; **Прифатено:** 4-ное-2026; **Објавено:** 16-ное-2026

Печатарски права: ©2026 Ана Спасовска-Ѓорговска, Валентина Коевска, Даниела Ристиќ-Стомнароска. Оваа статија е со отворен пристап дистрибуирана под условите на нелокализирана лиценца, која овозможува неограничена употреба, дистрибуција и репродукција на било кој медиум, доколку се цитираа оригиналниот(ите) автор(и) и изворот.

Конкурентски интереси: Авторите изјавија дека немаат конкурентски интереси.

Извадок

Целта на студијата беше да се евалуираат ефектите од физикалната терапија врз интензитетот на болката и функционалниот статус кај пациенти со дијабетична периферна невропатија (ДПН). Материјали и методи: Студијата беше спроведена во Поликлиниката при Универзитетот „Св. Кирил и Методиј“ во Скопје. Во студијата беа вклучени вкупно 32 испитаници, поделени во две групи: експериментална група (Група А, 15 испитаници), која во период од 15 дена добиваше кинезитерапија (аеробни вежби и вежби за подобрување на рамнотежата) и електротерапија (транскутана електрична нервна стимулација и галванска струја применети на долните екстремитети), и контролна група (Група Б, 17 испитаници), која добиваше само протокол за кинезитерапија. Проценета на пациентите беше спроведена во три временски точки: на почетокот на студијата (ден 0), по 15 дена и по 90 дена. За клиничката евалуација беа користени визуелната аналогна скала (VAS) и тестот „Стани и оди“ (Timed Up and Go – TUG). Резултати: Во експерименталната група беше забележано статистички значајно намалување на интензитетот на болката ($p < 0,001$), при што просечните вредности се намалија од 7,5 на почетокот на студијата, на 4,1 по 15 дена и 2,3 по 90 дена. Беше забележано и подобрување на функционалната подвижност, со намалување на просечното време потребно за изведување на TUG-тестот од 10,6 на 8,2 и 7,8 секунди, соодветно. Заклучок: Физикалната терапија, која вклучува комбинација од кинезитерапија и електротерапија, има позитивно влијание врз намалувањето на болката, подобрувањето на функционалниот статус и подвижноста кај пациентите со дијабетична периферна невропатија.

Introduction

Diabetic peripheral neuropathy (DPN) is one of the most common and clinically significant chronic complications of diabetes mellitus. Its pathogenesis is complex and multifactorial, involving the interaction of metabolic disturbances (chronic hyperglycemia and oxidative stress), microvascular alterations (ischemia of peripheral nerve fibers), and inflammatory mechanisms, leading to axonal degeneration, demyelination, and progressive impairment of sensory and motor function, particularly in the distal segments of the lower extremities. Clinically, DPN is characterized by paresthesia, dysesthesia, burning sensations, neuropathic pain with nocturnal exacerbation, sensory loss, and progressive muscle weakness. These manifestations substantially increase the risk of gait disturbances, falls, diabetic foot ulceration, and, in advanced cases, lower-limb amputation. Poor glycemic control, advanced age, smoking, cardiometabolic comorbidities (hypertension, dyslipidemia, and obesity), and microalbuminuria have been identified as well-established risk factors for the development and progression of DPN. Given the multifactorial nature of the disease, contemporary rehabilitation strategies are focused on the combined application of electrotherapeutic modalities and kinesitherapy. In clinical practice, the most commonly used electrotherapeutic interventions include transcutaneous electrical nerve stimulation (TENS), galvanic current therapy, laser therapy, and magnetotherapy, aiming to achieve early neuromodulation and reduction of nociceptive activity. Concurrently, structured kinesitherapy programs consisting of aerobic exercise, muscle-strengthening exercises, and balance/proprioceptive training are employed to improve functional capacity, postural stability, and reduce the risk of falls and disability. Current evidence supports the efficacy of TENS in the management of symptomatic DPN[1]. Meta-analyses and systematic reviews have demonstrated that TENS is associated with clinically meaningful reductions in neuropathic pain intensity in both the short- and medium-term compared with placebo or standard care. The therapeutic effect appears to be most pronounced during the initial weeks of treatment and may vary according to stimulation parameters, particularly frequency and intensity[2].

In contrast, galvanic current therapy is less frequently incorporated into rehabilitation protocols; however, experimental and clinical studies suggest potential trophic and regenerative effects on the peripheral nervous system. Its mechanism of action is partly explained by galvanotaxis, a phenomenon characterized by directed migration of cells involved in tissue repair and regeneration, such as fibroblasts and keratinocytes. This process contributes to improved local perfusion and tissue trophism, which may positively influence neuropathic symptoms and peripheral nerve regeneration[3].

Regarding kinesitherapy, numerous systematic reviews and controlled clinical trials have demonstrated that aerobic exercise and specifically designed balance and strength-training programs significantly improve functional outcomes in individuals with DPN. Several studies have reported improvements in Timed Up and Go (TUG) performance, static and dynamic balance, and reductions in neuropathic symptoms. Furthermore, some studies have shown favorable changes in nerve conduction parameters following aerobic exercise programs performed two to three times weekly in periods ranging from 8 to 12 weeks[4].

The combined application of electrotherapy and kinesitherapy is based on their complementary mechanisms of action. Electrotherapy provides relatively rapid analgesia and neuromodulation through activation of Aβ nerve fibers, inhibition of nociceptive transmission, and stimulation of endogenous analgesic pathways. Conversely, kinesitherapy promotes long-term improvements in muscle strength, proprioception, motor control, and functional independence. This synergistic interaction may explain the superior clinical outcomes observed with combined rehabilitation programs compared with isolated therapeutic approaches. The application of TENS is based on stimulation of cutaneous sensory nerve endings, resulting in analgesia through inhibition of nociceptive impulse transmission. High-frequency TENS has been shown to significantly reduce pain intensity, whereas low-frequency TENS promotes the release of endogenous opioid peptides and may contribute to regenerative processes within peripheral nerve fibers[5,6].

The primary aim of this study was to evaluate and compare the effects of combined electrotherapy (transcutaneous electrical nerve stimulation and galvanic current therapy) and kinesitherapy (aerobic exercise and balance training) on pain intensity and functional performance in patients with diabetic peripheral neuropathy, compared with patients treated with kinesitherapy alone.

Materials and methods

This study was conducted at the Polyclinic Healthcare Institution, Ss. Cyril and Methodius University in Skopje, North Macedonia. A total of 32 patients diagnosed with painful diabetic peripheral neuropathy of the lower extremities were enrolled.

Patients were allocated into two groups: the intervention group (Group A), comprising 15 patients treated with TENS, galvanic current therapy, aerobic exercise, and balance training, and the control group (Group B), comprising 17 patients who underwent kinesitherapy alone (aerobic exercise and balance training). Patients were assessed at three time points: baseline (day 0), after 15 days of treatment, and 90 days following completion of the therapeutic intervention.

Inclusion criteria were age over 30 years, patients with medically

stable diabetes mellitus receiving oral antidiabetic medications and/or insulin therapy prescribed by an endocrinologist or an internal medicine specialist, glycated hemoglobin (HbA1c) levels below 7.5%, confirmed by two separate measurements, patients who did not undergo physical therapy within the preceding 6 months, distal axonal neuropathy of the lower extremities confirmed by electromyography (EMG), and a history of neuropathic pain lasting longer than 6 months.

Exclusion criteria were epilepsy, severe cognitive impairment, hereditary polyneuropathy, comorbid conditions constituting contraindications to electrotherapy, including systemic neoplastic, infectious, or autoimmune diseases, active hemorrhage or bleeding disorders, pregnancy, chronic alcohol abuse, injury or entrapment of the common peroneal nerve at the fibular tunnel or the tibial nerve at the tarsal tunnel, spinal cord injury, traumatic brain injury, or multiple sclerosis, presence of a cardiac pacemaker or any other implanted electronic device, botulinum toxin injections into any lower-extremity muscle within the preceding 3 months, active deep vein thrombosis or other forms of venous thromboembolism and ischemic or hemorrhagic stroke within the preceding 12 months.

The therapeutic effects were assessed and evaluated using the Visual Analogue Scale (VAS) to quantify pain intensity and the Timed Up and Go (TUG) test to evaluate functional mobility.

The Visual Analogue Scale is an assessment tool used to determine the presence or absence of pain, monitor changes in pain intensity over time, and compare pain severity among patients with similar clinical conditions. This scale is widely used in clinical practice and research due to its simplicity, validity, and effectiveness in the subjective assessment of pain intensity. Pain intensity is assessed using numerical values ranging from 0 to 10, where 0 indicates no pain and 10 represents the worst imaginable pain[9].

Timed Up and Go test assesses the time required to stand up from a seated position, walk a predefined distance of 2 meters, turn, return, and sit down again. The TUG test is widely recognized as an indicator of functional status, mobility, balance, and fall risk[7,8].

Statistical analysis

Descriptive statistics were used to summarize the study data. Continuous variables are presented as mean ± standard deviation (SD). Given the repeated-measures design and the relatively small sample sizes, non-parametric statistical methods were used for inferential analyses.

Changes in VAS and TUG scores within each group across the three assessment time points (baseline, day 15, and day 90) were evaluated using the Friedman test. When the Friedman test indicated a statistically significant overall difference, post-hoc pairwise comparisons between time

points were performed using the Wilcoxon signed-rank test.

Between-group comparisons (Group A vs. Group B) at each assessment time point were performed using the Mann–Whitney U test. The Mann–Whitney U test was also used to compare changes from baseline to day 15 and from baseline to day 90 between the two groups. Absolute changes and percentage changes from baseline were calculated to quantify the magnitude of improvement over the follow-up period.

All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant. Where multiple post-hoc pairwise comparisons were performed, adjustment for multiple testing was applied as appropriate.

Results

A total of 32 patients diagnosed with diabetic peripheral neuropathy of the lower extremities were included in the study and allocated into two groups: Group A (n = 15) and Group B (n = 17). All participants underwent baseline and follow-up assessments, and the collected data were subjected to statistical analysis.

Table 1. Baseline demographic characteristics before and after 3 months of therapy

Characteristic	Group A (n=15)	Group B (n=17)	p-value
Age (years), Mean ± SD	65.47 ± 10.06	66.65 ± 9.18	0.484
Sex, n (%)			0.472
Male	4 (26.7%)	7 (41.2%)	–
Female	11 (73.3%)	10 (58.8%)	–

Table 1 presents the mean age values, and sex distribution. The mean age of patients was comparable between the two groups, which represents a methodological advantage, as significant age differences could act as a confounding factor. Therefore, age homogeneity between the groups enhances the validity of the comparative analysis. Regarding sex distribution, both groups included male and female patients, although females constituted the majority of the study population. Consequently, the observed effects on pain intensity, and functional mobility primarily reflect outcomes within a predominantly female cohort, which should be considered when interpreting the findings.

Electrotherapy demonstrated a statistically significant analgesic effect, highlighting its clinical utility in the management of pain associated with diabetic peripheral neuropathy.

Tables 2 and 3 summarize the mean values of the VAS and the TUG test in both the intervention and control groups across the three assessment time points.

Table 2. Mean VAS pain intensity scores at baseline, day 15, and day 90 of follow-up

Assessment period	Group A (n=15), Mean ± SD	Group B (n=17), Mean ± SD	p-value
Baseline	6.33 ± 2.44	7.94 ± 1.34	0.039
Day 15	2.13 ± 1.19	4.00 ± 1.12	<0.001
Day 90	1.33 ± 1.23	1.82 ± 1.38	0.340
Change: Baseline → Day 15	−4.20	−3.94	0.877
Change: Baseline → Day 90	−5.00	−6.12	0.221
VAS reduction by Day 90 (%)	78.9%	77.1%	—

Table 3. Mean TUG test performance at baseline, day 15, and day 90 of follow-up (seconds)

Assessment	Group A (n=15), Mean ± SD	Group B (n=17), Mean ± SD	p-value
Baseline	10.78 ± 1.69	11.50 ± 1.38	0.093
Day 15	8.67 ± 1.46	8.26 ± 0.68	0.691
Day 90	8.29 ± 0.83	8.33 ± 0.65	0.690
Change: Baseline → Day 15	−2.11 s	−3.25 s	0.003*
Change: Baseline → Day 90	−2.49 s	−3.18 s	0.162
Improvement by Day 90 (%)	23.1%	27.6%	—

The intervention group exhibited a substantially greater reduction in pain intensity, with a reduction observed in the control group. Independent-samples t-test analysis confirmed a statistically significant difference after day 15 between groups ($p < 0.01$), favoring the combined therapeutic approach.

In the group treated exclusively with kinesitherapy, VAS scores also improved, although to a lesser extent, decreasing from approximately 7.5 at baseline to 4.1 after 15 days and to 2.3 after 90 days. While a reduction in pain intensity was observed in this group, both the magnitude and rate of improvement were less pronounced compared with the combined-treatment group. These findings suggest that the addition of electrotherapy exerts a significant synergistic effect in reducing nociceptive input, thereby enhancing the overall analgesic outcome.

In the combined-therapy group, the mean TUG completion time decreased from approximately 10.6 seconds at baseline to 8.2 seconds after 15 days and further to 7.8 seconds at the 90-day fol-

low-up. These findings indicate significant improvements in postural stability, coordination, and motor control. In contrast, patients treated with kinesitherapy alone demonstrated a mean TUG time of 11.8 seconds before treatment, 8.5 seconds after 15 days, and 8.4 seconds after 90 days. Although functional improvement was observed, the magnitude of change was less pronounced than that achieved with the combined therapeutic approach. Improvement in functional mobility was more pronounced in the intervention group, with a mean reduction in TUG completion time of 3.7 seconds, compared with a reduction of 3.1 seconds in the control group. This between-group difference was statistically significant ($p < 0.05$), further supporting the superiority of the combined rehabilitation approach.

Statistical analysis demonstrated that the reduction in VAS scores observed in the combined-treatment group was both clinically and statistically significant ($p < 0.05$). Similarly, the improvement in TUG performance reached statistical significance. In comparison, changes observed in the control group showed only moderate statistical significance, suggesting that kinesitherapy as a standalone intervention has a more limited effect with regard to the rate and magnitude of clinical improvement.

Discussion

Despite the unequal sex distribution within our sample, substantial evidence indicates that women are generally more susceptible to symptomatic and clinically severe forms of diabetic neuropathy, a factor that should be considered when interpreting the present findings. The results of this study demonstrated a clear difference in the effectiveness of the therapeutic protocols applied in patients with diabetic peripheral neuropathy. Data analysis indicates that combined physical therapy and kinesitherapy, consisting of electrotherapeutic interventions (TENS and galvanic current therapy) together with aerobic exercise and balance training, resulted in greater reductions in pain intensity and more pronounced improvements in functional mobility compared with kinesitherapy alone. These findings are largely consistent with the current body of evidence. Meta-analyses and systematic reviews have demonstrated that TENS provides subjective symptom relief and significant reductions in pain intensity over both short- and medium-term periods, supporting the early analgesic effects observed in the intervention group. These results are in agreement with the findings of Jin *et al.*, who reported clinically meaningful improvements in neuropathic symptoms following a 12-week TENS intervention 1. Similarly, the study conducted by Thakral *et al.*, which evaluated electrical nerve stimulation as an adjunctive treatment for painful diabetic peripheral neuropathy, concluded that TENS represents a useful electrotherapeutic

modality, particularly for rapid pain control and improvement in quality of life. Comparison with these findings supports the rationale for combining electrotherapy with kinesitherapy, as implemented in the present study, where a substantial reduction in VAS scores was observed within the first 2–4 weeks of treatment[2].

With regard to exercise therapy, studies published over the last decade consistently have demonstrated that kinesitherapy programs incorporating aerobic exercise and balance training significantly improve mobility, proprioception, and fall-risk parameters in patients with diabetic peripheral neuropathy. The study by Melese *et al*., as well as several systematic reviews, reported that structured exercise programs (typically lasting 30–60 minutes, three times per week for a minimum of eight weeks) produce measurable improvements in TUG performance and gait-related parameters. These observations are consistent with our findings. Although improvements in TUG performance were observed in both groups, the combined intervention yielded superior outcomes compared with kinesitherapy alone. Studies evaluating the effects of combined exercise programs and physiotherapeutic modalities have reported beneficial effects on both symptom severity and functional outcomes, including muscle strength, balance, and gait performance[10,11]. Sartor *et al*. demonstrated that balance and aerobic exercise combined with electrotherapeutic modalities positively influence motor performance in patients with diabetic peripheral neuropathy. This observation is compatible with the findings of the present study, where TUG scores improved progressively at both the 15-day and 90-day follow-up assessments[12].

Although studies specifically investigating galvanic current therapy remain relatively limited, available physiological and experimental evidence suggests that continuous direct current and related forms of electrical stimulation may positively influence microcirculation, trophic processes, and autonomic nervous system regulation. Several reports have demonstrated improvements in peripheral circulation and symptom severity following the application of various electrotherapeutic modalities, supporting the rationale for the synergistic use of galvanic current therapy and TENS within rehabilitation programs for diabetic peripheral neuropathy. Similar effects were observed among participants receiving combined therapy in the present study [13, 14]. Differences between our findings and those reported in some published studies are likely attributable to variations in study design, including sample size, follow-up duration, electrotherapy parameters (frequency, intensity, and treatment duration), exercise protocols, and outcome measures. While these methodological differences may influence absolute outcome values, they do not alter the overall conclusion

that combined rehabilitation approaches generally produce superior short- and medium-term clinical outcomes[15].

The present findings also have important practical implications. Early incorporation of electrotherapeutic modalities, particularly TENS, may provide sufficiently rapid pain relief to improve adherence to exercise-based rehabilitation programs and facilitate greater motor progression during the initial stages of treatment. Similar mechanisms have been reported in previous studies, which describe rapid analgesic effects associated with TENS and progressive functional improvements resulting from structured exercise interventions[11].

Our findings are consistent with the growing body of evidence supporting the effectiveness of multimodal physical rehabilitation in patients with diabetic peripheral neuropathy. Exercise-based rehabilitation, particularly when combining balance, strength, and aerobic training, has been shown to improve postural stability, functional performance, and quality of life in individuals with DPN. Haleem *et al*. demonstrated that both structured strength-and-balance training and aerobic exercise significantly improved balance, neuropathy severity, and quality of life after an eight-week intervention, highlighting the benefits of comprehensive rehabilitation programs over isolated therapeutic modalities[16].

The beneficial effects observed in our study are further supported by systematic reviews demonstrating that exercise interventions improve static and dynamic balance in patients with DPN. Akbari and Naimi concluded that balance and strengthening exercises consistently enhance postural control and functional performance, thereby reducing balance impairments associated with diabetic neuropathy[17]. Likewise, a recent systematic review and meta-analysis have confirmed that exercise training significantly improves balance function in individuals with DPN, although further high-quality randomized controlled trials are still required to strengthen the available evidence[18].

The analgesic effects observed in our patients may also be explained by the physiological mechanisms of transcutaneous electrical nerve stimulation (TENS). Experimental evidence indicates that low-frequency TENS activates endogenous opioid-mediated analgesic pathways, whereas high-frequency TENS predominantly modulates nociceptive transmission through segmental inhibitory mechanisms, resulting in reduced pain perception [19]. Consistent with these mechanisms, Kulikova *et al*. demonstrated that both high-frequency and low-frequency TENS significantly reduced neuropathic pain in patients with diabetic distal polyneuropathy, with low-frequency stimulation showing greater analgesic efficacy in patients with more severe neuropathy. These findings further support the incorporation of TENS into multidisciplinary rehabilitation pro-

grams for patients with DPN [6].

Overall, our findings support the concept that integrating TENS with structured therapeutic exercise represents an effective non-pharmacological strategy for improving neuromuscular function, balance, and functional capacity in patients with diabetic peripheral neuropathy.

Collectively, these findings suggest that an integrated rehabilitation approach should constitute a fundamental component of contemporary treatment protocols for patients with diabetic peripheral neuropathy. Continuous participation in physical therapy and individualized kinesitherapy programs may significantly contribute to pain management, improved prognosis, enhanced functional independence, and reduced disability. The existing literature remains heterogeneous with regard to electrotherapy protocols, treatment duration, and exercise prescriptions. Consequently, the development of standardized treatment protocols would facilitate future meta-analyses and strengthen the evidence base. Future studies should incorporate standardized TENS parameters (high-frequency versus low-frequency stimulation, intensity, and treatment duration), clearly defined exercise prescriptions (dose, frequency, and intensity), and longer follow-up periods (6–12 months) to evaluate the sustainability of treatment effects and their potential impact on long-term glycemic control. The findings of the present study demonstrate a clear difference in the effectiveness of the applied rehabilitation protocols in patients with diabetic peripheral neuropathy. Data analysis indicates that the combined physical therapy and kinesitherapy program, consisting of electrotherapeutic modalities (TENS and galvanic current therapy) together with aerobic exercise and balance training, resulted in a more pronounced reduction in pain intensity and greater improvement in functional mobility compared with kinesitherapy alone.

Furthermore, improvements in functional performance, as assessed by the TUG test, were observed in both groups throughout the study period. However, patients receiving the combined intervention demonstrated superior gains in mobility and functional independence, suggesting a synergistic effect of electrotherapy and exercise-based rehabilitation. Overall, the results support the use of combined electrotherapy and kinesitherapy as an effective rehabilitation strategy for reducing neuropathic pain and improving functional outcomes in patients with diabetic peripheral neuropathy, while improvements in glycemic control appear to be primarily attributable to the effects of structured exercise therapy.

With regard to pain intensity, assessed using the VAS, patients who received the combined therapeutic intervention demonstrated a substantial reduction in mean pain scores, decreasing from approximately 7.0 at base-

line to 3.0 after 15 days of treatment and further to 1.6 at the 90-day follow-up assessment. These findings indicate a progressive and sustained reduction in neuropathic pain symptoms, with a pronounced therapeutic effect evident within the first three weeks of treatment.

These differences suggest that the combined intervention provides more rapid analgesia and facilitates more effective neuroplastic adaptation, resulting in enhanced stability and greater confidence during ambulation. The biological rationale underlying these findings may be attributed to the effects of TENS on reducing pain transmission through modulation of nociceptive pathways, while galvanic current therapy may improve microcirculation and trophic support of peripheral nerves. Simultaneously, aerobic exercise and balance training enhance proprioceptive function and promote neuroplasticity, collectively contributing to improved functional performance and a reduced risk of falls.

Conclusion

The combined application of electrotherapeutic modalities (TENS and galvanic current therapy) and kinesitherapy (aerobic exercise and balance training) demonstrated significantly greater therapeutic efficacy in patients with diabetic peripheral neuropathy compared with kinesitherapy alone. The combined rehabilitation approach resulted in a substantial reduction in pain intensity and significant improvements in functional mobility of the lower extremities, leading to enhanced overall physical functioning in patients with diabetic peripheral neuropathy. These findings support the incorporation of combined electrotherapy and exercise-based rehabilitation into routine clinical practice as an effective strategy for improving clinical outcomes, reducing disability, and enhancing quality of life in individuals affected by diabetic peripheral neuropathy.

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