

# Physical Therapy for Diabetic Peripheral Neuropathy: A Narrative Review

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## Introduction

Diabetes has become one of the largest global healthcare problems of the 21<sup>st</sup> century. In 2017, International Diabetes Federation estimates showed that approximately 425 million adults (20-79 years of age) were living with diabetes; by 2045 this number will rise to 629 million (Cho et al, 2018). Diabetic neuropathy is the most common complication associated with diabetes mellitus. Diabetes causes a broad spectrum of neuropathic complications, including acute and chronic forms affecting each level of the peripheral nerve, from the root to the distal axon. Diabetic peripheral neuropathy significantly lowers quality of life and substantially increases health costs associated with diabetes (Asif, 2014). Those with DPN experience a twofold increase in healthcare costs, and those with severe painful peripheral neuropathy experience a fourfold increase. On a larger scale, it has been estimated that about 27% of healthcare costs of diabetes can be attributed to DPN.

## Aim

The aim of this narrative review is to introduce literature on physical therapy for diabetic peripheral neuropathy to deepen the understanding of exercise therapy, and then describe how to prescribe physical therapy for clients with diabetic peripheral neuropathy.

## Method

A literature search was performed using Google Scholar, PubMed and Cochrane databases. A total of 66 items showed up on PubMed and 20 on Cochrane with the term "balance training in DPN". The search terms used were 'Diabetes mellitus', 'physical therapy', 'neuropathic pain', 'diabetic peripheral neuropathy', 'glycemic control', 'balance', 'gait', 'falls risk', 'proprioception' and 'postural control'. Research articles published in English, between the years 2000 and 2018, were included. The studies were double checked and only full text articles were used for the review. Totally, 21 studies were selected to emphasize the effect of physical therapy among DPN clients. These studies were reviewed in a narrative way, and the main findings are summarized.

## Symptoms associated with Painful Diabetic Neuropathy

- Pain
- Paresthesia
- Allodynia
- Impairment of vibration sense
- Reduced thermal sensation
- Loss of pinprick sensation
- Bed sheet or sock intolerance
- Restless legs syndrome

## Risk Factors for DPN

- Older age
- Smoking
- Heavy alcohol intake
- Change in Hb A1c
- Longer duration of diabetes
- Long-term poor glycemic control: Perturbation of insulin signaling secondary to insulin resistance, results in neuronal damage and contributes to the pathogenesis of DPN
- Cardiovascular risk factors: obesity, dyslipidemia, and hypertension
- Long-term poor glycemic control and dyslipidemia emerge as the major modifiable risk factors

## Screening and Diagnosis

- HbA1c (reflective of how well diabetes is controlled)
- Biochemistry: Triglycerides, HDL, LDL
  - Renal Function Tests
  - Blood Pressure
  - MRI
  - Nerve Conduction Testing
- The Michigan Neuropathy Screening Instrument (MNSI)
- Brief Pain Inventory short form for Diabetic Peripheral Neuropathy (BPI-DPN).
- Neuropathy Disability Score (NDS)
- Neuropathy Symptom Score (NSS)
  - Visual Analog Scale
- Semmes Weinstein Monofilament (SWM)
  - BMI
  - Reflexes

## Physical Therapy for Diabetic Neuropathy

Exercise is known to improve multiple metabolic factors that may affect nerve health and microvascular function, which may indirectly protect against peripheral nerve damage.

**Aerobic Training:** The aim is to complete 150 minutes of aerobic exercise per week, spread over 3 days, with no more than 2 consecutive days between exercise bouts. The physical therapist should assess the baseline activity level with a quantitative device to achieve this aim. However, people with DPN have been advised to be cautious about increasing their activity level. Aerobic training including cycle ergometer, treadmills, recumbent steppers, and elliptical trainers can be used. Exercise sessions should start with brief stretching and/or a 5-minute warm-up period, and finish with a 5–10 minute cool-down period.

**Flexibility Exercises:** Flexibility exercises should also be included because they address joint range-of-motion limitations, particularly in the ankle, hip and shoulder. Gentle stretching for 5 to 10 minutes helps the body to warm up and get ready for aerobic activities such as walking or swimming. Hamstring stretch, calf stretch, knee to chest stretch, toe curls and bipedal ankle inversion and eversion can be safely utilized as flexibility exercises.

**Strength Training Exercises:** In addition to aerobic conditioning, the joint statement of the American College of Sports Medicine and the ADA recommends 2 or 3 days of large-muscle-group resistance training per week. This training should include a minimum of 1 set of 5 or more resistance exercises.

**Balance and Gait Training Strategies:** General exercises for balance improvement have already been shown to be efficient in DPN clients. A good body of studies reported that there was improvement in static balance such as one-leg stance (Song et al, 2011), tandem stance (Richardson et al, 2001), as well as in the dynamic balance such as forward reached test, walk over beam and five times sit to stand (Lee et al, 2013). A marked progress in the gait parameters such as gait speed, stride length and cadence (Raghav et al, 2013) was also recorded following balance training.

## Conclusion

The literature review shows that individuals with DPN can improve their confidence and balance with aerobic exercise, balance and gait training strategies, flexibility exercise, and strength training exercise.