

Progressive Resistance Training Improves Muscle Strength in Type 2 Diabetic Polyneuropathy

Aim: In this study, the effects of progressive resistance training (PRT) on muscle strength, motor nerve function, and intraepidermal nerve fiber density (IENFD) were assessed in persons with type 2 diabetes (T2D) with and without diabetic polyneuropathy (DPN) and healthy controls.

Methods: In this assessor-blinded trial, N=109 participants were randomized 1:1 to supervised PRT versus no intervention for 12 weeks. Of the 109 participants, n=42 had T2D with DPN (assessed by the Toronto Clinical Neuropathy Score and abnormal nerve conduction tests), n=32 had T2D without DPN, and n=35 were healthy controls. The primary outcomes were muscle strength (maximal peak torque of the knee and ankle extensors and flexors) and IENFD. Secondary outcomes included the 6 min walk test, five-time sit-to-stand test, and postural stability index. Exploratory outcomes included patient-reported outcomes (quality of life, neuropathy symptoms, depression, fatigue, and fear of falling).

Results: At baseline, T2D participants with DPN were noted to have a higher BMI but the groups were otherwise similar. There was high adherence to the PRT protocol with no significant differences between the groups. T2D with DPN, T2D without DPN and healthy control participants in the PRT arm all had statistically significant increases in muscle strength compared to those who did not receive PRT. There were no changes in IENFD in any participants in the PRT arm. T2D with DPN participants demonstrated improvements in the 6 min walk test and five-time sit-to-stand test. PRT did not result in improvements in postural stability or any of the patient-reported outcomes.

Conclusions: Progressive resistance training improves muscle strength and function and should be further evaluated as a potential therapeutic intervention for persons with T2D and DPN.

Comments. The therapeutic benefits of physical exercise for DPN have been suggested in multiple recent studies with demonstrated improvements in symptoms (Kluding PM et al *J Diabetes Complications*. 2012;26:424-429), gait (Allet L et al *Diabetologia*. 2009;53:458-466), balance and postural stability (Thukral N et al *Curr Diabetes Rev*. 2021;17:332-334) and epidermal nerve fiber branching (Kluding PM et al *J Diabetes Complications*. 2012;26:424-429). PRT has been shown to improve muscle strength in diabetes though has not been assessed in participants with DPN. This study is amongst the first to assess the effects of PRT on measures of motor nerve strength, motor function, and small fiber structure in T2D with DPN. The investigators found that PRT improves muscle strength and function without alterations in small fiber structure in T2D with and without DPN compared to healthy controls. This study has multiple strengths, including 1) robust inclusion criteria (including a thorough assessment of DPN); 2) inclusion of both T2D with and without DPN plus healthy controls; 3) comprehensive outcome measures. The main limitation of this study was the short intervention period of 12 weeks, which may have been insufficient time to see the structural changes in IENFD. This study adds to the growing body of evidence demonstrating therapeutic benefits of exercise on DPN. Larger and longer-term studies are needed to confirm the findings of this study.

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Reference. Khan KS, Overgaard K, Tankisi H, Karlsson P, Devantier L, Gregersen S, Jensen TS, Finnerup NB, Pop-Busui R, Dalgas U, Andersen H. Effects of progressive resistance training in individuals with type 2 diabetic polyneuropathy: a randomised assessor-blinded controlled trial. *Diabetologia*. 2022 Apr;65(4):620-631. doi: 10.1007/s00125-021-05646-6. Epub 2022 Jan 19.

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