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CASE REPORT

Effect of Task Oriented Progressive Resistance Strength on Muscle Strength and Functional Performance in an Individual with Diabetic Lumbosacral Radiculoplexus Neuropathy

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ABSTRACT

Background: Diabetic lumbosacral radiculoplexus neuropathy (DLRPN) is a rare but debilitating complication of diabetes mellitus, characterized by severe pain, asymmetric proximal muscle weakness, muscle wasting, and functional disability of the lower limbs. These impairments significantly affect gait, balance, and activities of daily living, leading to reduced independence and quality of life. Physiotherapy interventions, particularly progressive resistance strength training, may play a crucial role in improving muscle strength and functional outcomes in patients with DLRPN.

Objective: The objective of the study is to find the effect of task oriented progressive resistance strength training on muscle strength and functional performance in individual with Diabetic lumbosacral radiculoplexus neuropathy [DLRPN].

Methodology: This study involved a 56-year-old subject diagnosed with DLRPN presenting with lower limb weakness, selected based on inclusion and exclusion criteria. Muscle strength was assessed using manual muscle testing (MMT) and functional performance using the lower extremity functional scale (LEFS). A task-oriented progressive resistance strength training program was administered for 20 -30 minutes, 6 sessions per week for 6 weeks. Post-intervention assessment was done after 6 weeks using the same outcome measures.

Result: There was an improvement from moderate to adequate muscle strength of lower limb in MMT and moderate functional limitation to minimal functional limitation in LEFS, reflecting improved muscle strength and functional performance following intervention.

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Conclusion: Task-oriented progressive resistance strength training was effective in improving lower limb muscle strength and functional performance in an individual with diabetic lumbosacral radiculoplexus neuropathy following a 6-week intervention.

KEYWORDS

• Diabetic Neuropathies • Lumbosacral Plexus • Lower Extremity • Muscle Strength • Neurorehabilitation • Physical Performance

INTRODUCTION

Neurological conditions affecting the lower limbs can lead to significant weakness, reduced mobility, and functional limitations. Diabetic lumbosacral radiculoplexus neuropathy (DLRPN) is a rare complication of diabetes characterized by acute or sub-acute onset of pain followed by progressive weakness and muscle wasting in the lower extremities.[1]

DLRPN is a debilitating diabetic complication affecting fewer than one percent of patients. This condition typically presents as weakness and muscle loss in the upper legs and is currently understood to be caused by restricted blood flow to the nerves. Consider clarifying the connection to stroke here, as the transition is abrupt in the original text. Stroke, a sudden neurological impairment resulting from blood vessel damage within the central nervous system, is recognized as a primary global contributor to mortality and long-term disability. The condition arises from a diverse array of medical triggers rather than a single source.[2]

DLRPN has an estimated incidence of approximately 2.79 per 100,000 per year, affecting roughly 1 percent of the diabetic population. This condition predominantly appears in older men with type 2 diabetes. Statistical data suggests that while the syndrome is quite rare, it most frequently impacts individuals with a median age over 65.[3]

DLRPN is characterized by a single, asymmetrical progression of physical symptoms. Patients typically suffer from significant discomfort, diminished motor skills, and the wasting of proximal muscles. Additional complications include unintentional weight loss, the loss of natural reflexes, and sometimes a total loss of lower-body mobility. This illness is frequently observed in individuals who have recently been diagnosed with diabetes. The resulting lack of physical strength directly impacts mobility, leading to slower walking speeds and diminished stamina. Specifically, the force produced by lower-body muscles such as those in the hips, knees, and ankles is a critical factor in determining how well a person can move.[4]

Leg muscle power—which combines movement speed with strength—is a primary indicator of mobility in aging individuals. Research suggests that a lack of explosive power is closely tied to increased fall risks and difficulties with everyday tasks like climbing stairs or standing up from a chair. Interestingly, this specific type of physical capability deteriorates more rapidly than simple muscle strength as people grow older. Because of this steep decline, specialized training focusing on speed and velocity is often more beneficial for seniors than traditional resistance exercises. Ultimately, prioritizing power over basic strength may be the most effective way to preserve independence and mobility in later life.[5]

Loss of strength leads to increased weakness, making older adults more prone to difficulties in performing everyday activities and increasing their risk of falls. Progressive resistance training (PRT) is an exercise approach in which muscles work against external resistance that is gradually increased as strength improves. Such training is typically performed two to three times per week at moderate to high intensity, using equipment such as weight machines, free weights, or elastic resistance bands.[6]

This review aims to evaluate whether PRT is effective in enhancing muscle strength and physical function in older adults. Previous research indicates that older adults who perform resistance exercises experience significant gains in muscle strength. These individuals also show better performance in basic functional tasks, including walking,

climbing stairs, and rising from a chair more efficiently. Improvements are generally more pronounced for activities such as stair climbing and standing up from a seated position compared to walking speed. In addition, resistance-based strength training enhances overall physical function in older adults, including the ability to carry out more complex daily activities like bathing and meal preparation.[7]

Individuals suffering from lower limb weakness due to neurological conditions face significant physical challenges. These conditions frequently lead to diminished muscle power and a decreased capacity to perform routine daily tasks. Consequently, there is a pressing need to explore how targeted resistance training and task-based exercises might restore a patient's physical autonomy. By researching these therapeutic interventions, experts hope to enhance the overall strength and functional independence of those affected.[8]

CASE SUMMARY

A 56-year-old male diagnosed with Diabetic Lumbosacral Radiculoplexus Neuropathy (DLRPN), presenting with lower limb weakness and impaired functional mobility, was included in this case report. The subject was selected according to the predefined inclusion and exclusion criteria. A baseline assessment of lower limb muscle strength was performed using Manual Muscle Testing (MMT), while functional performance was assessed using the Lower Extremity Functional Scale (LEFS). The subject demonstrated lower limb muscle weakness, with an initial MMT grade of approximately Grade 3, and functional limitation as assessed by the LEFS.

The subject underwent a task-oriented progressive resistance strength training programme for 20–30 minutes per session, six sessions per week, for six weeks. The intervention consisted of functional and progressive strengthening exercises, including assisted sit-to-stand training, supported mini squats, step-up training, resistance-band knee extension, bridging, supported standing marching, resisted forward lunges, and resisted stair-climbing activities. Resisted forward lunges using ankle weights (Figure 1), weighted step-up exercises/resisted stair climbing (Figure 2), and resisted squats/ mini squats using a theraband (Figure 3) were included as part of the progressive training programme. The exercise intensity was progressively modified according to the subject's tolerance and ability.

Following completion of the six-week intervention, the subject was reassessed using the same outcome measures. The MMT results demonstrated an improvement in lower limb muscle strength from Grade 3 to Grade 4, while the LEFS score also improved, indicating better lower limb functional performance and reduced activity limitation. Overall, the case demonstrated positive changes in muscle strength and functional performance following task-oriented progressive resistance strength training.



Figure 1: Resisted forward Lunges (with ankle weights)



Figure 2: Weighted Step-up Exercise (resisted stair climbing)



Figure 3: Resisted Squats/Mini Squats with therband

DISCUSSION

This study aimed to evaluate how effective task-oriented progressive resistance strength training is for improving muscle strength and functional performance in patients with diabetic lumbosacral radiculoplexus neuropathy. The results show that this combined method effectively improves both muscle strength and functional performance. After the intervention, there was a noticeable increase in muscle strength, measured using Manual Muscle Testing (MMT), and functional performance, assessed with the Lower Extremity Functional Scale (LEFS). This suggests better neuromuscular control and improved ability to perform specific tasks. Neurological issues often lead to muscle weakness, poor motor control, and decreased functional independence. Task-oriented training focuses on practicing meaningful activities, while progressive resistance training builds muscle strength through gradual increases in load. Together, these approaches support motor relearning and neuroplasticity.[11]

Homby *et al*. (2016) found that task-specific and intensive training significantly enhances locomotor function and overall recovery in people with neurological conditions. Winstein et al. (2016) also showed that structured rehabilitation programs improve motor performance and functional outcomes for individuals with neurological impairments. Muscle strength is vital for functional performance in people with neurological deficits. In this study, the improved MMT grades reflected increased muscle strength, which led to better functional outcomes as measured by LEFS.[12]

Lee *et al*. (2017) supported this by reporting that progressive resistance training enhances muscle strength and functional mobility in stroke patients. Meanwhile, Dorsch *et al*. (2018) found that resistance training boosts muscle performance and functional capacity in individuals with neurological impairments. Recent systematic reviews also indicate that resistance training improves strength, balance, and functional performance in neurological rehabilitation. In this study, we used Manual Muscle Testing (MMT) and the Lower Extremity Functional Scale (LEFS) as outcome measures for muscle strength and functional performance in patients with weak lower limbs due to neurological issues.[13]

MMT is a well-recognized clinical tool for assessing muscle strength through graded resistance and is commonly used in neurological rehabilitation settings. Cuthbert *et al*. (2017) reviewed the reliability and validity of MMT, finding that it has good inter-rater reliability and practical use when standardized procedures are adhered.[14]

Paternostro-Sluga *et al*. (2018) analyzed muscle strength assessment methods and concluded that MMT has acceptable reliability and validity in neurological populations, especially when used alongside functional outcome measures. LEFS assessed the functional performance of the lower limb, covering activities such as walking, transfers, and daily tasks.[15]

Mehta *et al*. (2016) showed that LEFS has excellent test-retest reliability (ICC > 0.90) and strong construct validity in patients with lower limb dysfunction. Additionally, Alnahdi et al. (2017) evaluated LEFS's psychometric properties and reported high internal consistency and responsiveness, making it a reliable and valid tool for assessing functional outcomes in rehabilitation. In this study, the improved MMT grades indicated increased muscle strength, while better LEFS scores showed enhanced functional

performance.[16] These results align with recent evidence suggesting that using both strength and functional outcome measures offers a thorough assessment of rehabilitation effectiveness in neurological patients. This study has some limitations. First, the sample size was small, which limits how broadly these findings can be applied. Second, the study duration was short, and long-term effects were not evaluated. Lastly, while muscle strength and functional performance were assessed using MMT and LEFS, other factors like balance and coordination were not included as outcome measures. Future research can involve larger sample sizes, longer durations, and additional outcome measures. Different exercise interventions can also be compared to find the most effective rehabilitation methods for individuals with neurological conditions. Based on the findings of this study, task-oriented progressive resistance strength training improves muscle strength and functional performance, enhancing independence and reducing activity limitations for patients with neurological conditions.

CONCLUSION

The findings of this study concluded that the task oriented progressive resistance strength training is effective on muscle strength and functional performance in patients with neurological lower limb weakness

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REFERENCES

1. Dyck PJ, Norell JE, Dyck PJ, *et al*. Microvasculitis and ischemia in diabetic lumbosacral radiculoplexus neuropathy. Neurology. 1999;53(9):2113-2121.
2. Feigin VL, Norrving B, Mensah GA. Global burden of stroke. Circ Res. 2017;120(3):439-448.
3. Laughlin RS, Dyck PJ, Melton LJ III, Leibson C, Ransom J, Dyck PJB. Lumbosacral radiculoplexus neuropathy: incidence and association with diabetes mellitus. Neurology. 2019;92(11):e1184-e1194.
4. Bean JF, Leveille SG, Kiely DK, Bandinelli S, Guralnik JM, Ferrucci L. A comparison of leg power and leg strength within the InCHIANTI study: which influences mobility more? J Gerontol A Biol Sci Med Sci. 2003;58(8):728-733.
5. Bean JF, Kiely DK, LaRose S, Goldstein R, Frontera WR, Leveille SG. Increased velocity exercise specific to task improves leg power and mobility in older adults. J Gerontol A Biol Sci Med Sci. 2009;64(9):983-989.
6. Latham NK, Bennett DA, Stretton CM, Anderson CS. Systematic review of progressive resistance strength training in older adults. J Gerontol A Biol Sci Med Sci. 2004;59(1):48-61.
7. Liu CJ, Latham NK. Progressive resistance strength training for improving physical function in older adults. Cochrane Database Syst Rev. 2009;(3):CD002759.
8. de Vreede PL, Samson MM, van Meeteren NLU, Duursma SA, Verhaar HJJ. Functional-task exercise versus resistance strength exercise to improve daily function in older women: a randomized controlled trial. J Am Geriatr Soc. 2005;53(1):2-10.
9. Hornby TG, Reisman DS, Ward IG, Scheets PL, Miller A, Haddad D, *et al*. Clinical practice guideline to improve locomotor function following chronic stroke, incomplete spinal cord injury, and brain injury. J Neurol Phys Ther. 2020;44(1):49-100.
10. Winstein CJ, Stein J, Arena R, Bates B, Cherney LR, Cramer SC, *et al*. Guidelines for adult stroke rehabilitation and recovery. Stroke. 2016;47(6):e98-e169.
11. Dorsch S, Ada L, Canning CG, Al-Zharani M, Dean C. The strength training after stroke study: a systematic review and meta-analysis. Disabil Rehabil. 2018;40(19):2213-2223.
12. Cuthbert SC, Goodheart GJ Jr. On the reliability and validity of manual muscle testing: a literature review. Chiropr Osteopat. 2007;15:4.
13. Paternostro-Sluga T, Grim-Stieger M, Posch M, Schuhfried O, Vacariu G, Mittermaier C, *et al*. Reliability and validity of the Medical Research

Council (MRC) scale and a modified scale for testing muscle strength in patients with radial palsy. J Rehabil Med. 2008;40(8):665-671.

14. Alnahdi AH, Alrashid GI, Alkhaldi HA, Alderaa AA. Cross-cultural adaptation, validity and reliability of the Arabic version of the Lower Extremity Functional Scale. Disabil Rehabil. 2017;39(9):897-904.