ISSN : 2443-4019 | eISSN : 2502-2083
ADI HUSADA Nursing Journal
Jurnal Keperawatan - Sekolah Tinggi Ilmu Kesehatan Adi Husada Surabaya

Foot Exercise for Managing Neuropathic Pain in the Elderly

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Keywords :
Elder People, Foot Exercise, Neuropathic Pain

Abstract

Elderly people often experience neuropathic pain in the extremities of the feet which is caused by decreased blood vascularization in the feet. One effort that can be made to increase blood vascularization in the feet is by doing foot exercises. This study aims to determine the effect of foot exercises on pain conditions due to neuropathy experienced by the elderly. This research was Quasi-experimental research with 22 elderly people who met certain criteria and then divided into control and intervention groups. Variable which is pre and post-test neuropathic pain data were obtained using the Numeric Rating Scale instrument in the observation sheet. The Wilcoxon signed-rank test in the intervention group showed a p-value = 0.003, while in the control group the p-value= 0.643. These results indicate that the change in neuropathic pain was significant in the intervention group after being given foot exercises. Foot exercise movements have a relaxing effect on the feet, thereby stimulating the production of endorphin hormones. Endorphin hormones play a role in blocking substance P which plays a role in triggering pain. This blocked substance P results in the transmission of pain impulses in the spinal cord being hampered so that the intensity of neuropathic pain in the lower extremities can decrease.

INTRODUCTION

Neuropathic pain is a condition of the nervous system that is damaged or damaged in function. This condition of neuropathic pain is often experienced by someone who experiences decreased body function, especially the elderly. The neuropathy condition experienced by the elderly can disrupt daily life. Elderly people with neuropathy can experience sleep disorders, anxiety disorders, and depression compared to elderly people who do not experience neuropathy. (Devi, 2021). Elderly people with neuropathy can also experience a decrease in quality of life due to decreased sensory sensations such as touch or vibration stimuli, pain, temperature, and decreased productivity (Abdurrasyid et al., 2020). As we get older, the blood supply to the feet will decrease, so the elderly will feel pain due to previous illnesses which result in damage to the nerves which causes pain. This pain can have a significant influence on the condition of the elderly where the intensity of the pain felt will increase and become annoying when the elderly are doing activities. When pain appears, this causes the elderly to become disturbed in carrying out daily activities due to the sensation of very intense pain and pain. This pain can be caused by decreased blood circulation in the legs, resulting in symptoms of pain in the legs when standing, walking, and doing activities. The impact of the pain that arises can reduce the daily activities of the elderly.

The treatment that can be done to improve this neuropathy condition is by providing therapy that can optimize blood circulation and cells in the feet. Optimal blood circulation in the legs can influence changes in the intensity of pain felt by elderly people who complain of pain in their legs, which will help reduce the pain. Various efforts can be made to provide treatment for the condition of neuropathic pain in the elderly. Patients with complaints of neuropathic pain can be treated using education, adjusting diet, pharmacological therapy, and

physical activity. One of the management efforts for neuropathic pain is to do physical activity such as exercising (Suhertini & Subandi, 2016). Exercise that is useful for controlling the appearance of neuropathic pain is through exercise that can increase blood circulation in the legs. One of the types of exercise that can increase blood circulation to the feet is a therapeutic method for dealing with neuropathic pain by doing foot exercises (Simamora et al., 2020). These things encouraged researchers to research the effect of foot exercises on reducing neuropathic pain in the elderly.

Neuropathic pain is ranked 4th with a percentage of 11% according to the World Health Organization (WHO) (Emril et al., 2018). The prevalence of neuropathic pain in the world is 25% of diabetes sufferers (Dinarqi, 2021). In the general population, it is estimated that the prevalence of neuropathic pain is between 7% and 10% in developed countries (Purwata et al., 2016). The neuropathic pain prevalence can increase along with the age of the sufferer and the duration of the disease, the prevalence rate can reach 50% in patients who have suffered from the disease before (Rantung, 2019). Neuropathic pain occurs due to high levels of damage or pressure on the nerves. This results in pain in the area experiencing damage or pressure, so sufferers will experience several serious, life-threatening health problems that require high medical care costs, decreased quality of life, and increased mortality (Simamora et al., 2020). Elderly people often experience productivity problems due to the sensation of pain they feel due to the nerve damage they experience. The disruption of nerve function that does not receive appropriate treatment can cause a decrease in quality of life. The most common symptom of nerve disruption felt by the elderly is complaints of tingling. As the amount of damage or pressure that occurs on the nerves increases, complications can result from this damage, which can lead to neuropathic pain (Budi et al., 2021).

Neuropathic pain in the elderly causes effects such as decreased strength and limited movement of the joints in the legs. Elderly people will experience structural changes such as protruding skin, changes in skin and nails, wounds on the feet, blood vessel disorders, and nervous disorders, which can also lead to the risk of amputation. These things make it necessary to treat neuropathy conditions, one of which is foot exercises. Due to these things, elderly people who have complaints of neuropathy need to receive treatment with foot exercises. Foot exercises can improve blood circulation and prevent worsening neuropathy in the elderly (Yulita et al., 2019). It is hoped that foot exercises can be a form of physical activity management that can reduce pain caused by neuropathy in the elderly.

RESEARCH METHODS

This research is a quasi-experimental research with a control group. The subjects in this research were elderly residents of the Tresna Werdha Jombang Social Services UPT in Pare Kediri and according to the criteria, there were 22 people. Subjects were then divided into a control group and an intervention group, where each group consisted of 11 subjects. The intervention provided was in the form of foot exercises which were carried out twice per week and carried out for 2 weeks. Pre-test and post-test neuropathic pain data were obtained using the Numeric Rating Scale instrument in the observation sheet. The data that was obtained was then analyzed using the Wilcoxon signed-rank test. This research has passed the ethical requirements held at the Bhakti Wiyata Kediri Institute of Health Sciences with number 202/FIK/EP/III/2023.

RESULT

Table 1 provides information that the respondents in the intervention group in this study were mostly women with 7 respondents (63.6%), while in the control group, the majority were men with 8 respondents (72.7%). There is also shows that the majority of respondents were aged 60-79 years in the intervention group and control group, totaling 9 respondents (81.8%).

Table 1
Respondent Gender and Ages Characteristics

Gender	Intervention Group		Control Groups	
	F	%	F	%
Male	4	36.4	8	72.7
Female	7	63.6	3	27.3
Total	11	100	11	100
Age	**Intervention Group**		**Control Groups**	
	F	**%**	**F**	**%**
60 – 79	9	81.8	9	81.8
80 – 90	2	18.2	2	18.2
Total	11	100	11	100

Table 2
Neuropathic Pain Before The Foot Exercise Application

Pain Classifications	Intervention Group		Control Groups	
	F	%	F	%
Mild	0	0	2	18.2
Moderate	7	63.6	7	63.6
Severe	4	36.4	2	18.2
Total	11	100	11	100

Based on Table 2, it can be seen that before being given foot exercises, the neuropathic pain scale in the intervention group and control group mostly had a moderate pain scale, 7 respondents (63.6%). In contrast to the control group, in the intervention group, there were no respondents with mild pain before being given the intervention.

Table 3
Neuropathic Pain After The Foot Exercise Application

Pain Classifications	Intervention Group		Control Groups	
	F	%	F	%
Mild	0	0	0	0
Moderate	10	90.8	11	100
Severe	1	9.2	0	0
Total	11	100	11	100

Table 4 shows that after being given foot exercises, respondents with severe pain on the scale were reduced to 1 person (9.2%) and almost all of them were in the moderate pain category (90.8%). In the control group, all respondents show a moderate pain scale. Table 2 and 3 provide information that in the intervention group, 3 subjects experienced an improvement in their pain scale, 8 people whose pain scale remained the same, and there were no research subjects who experienced a worsening in their pain scale. Different things were found in the control group. Subjects in the control group experienced a worsening of the pain scale in 2 people, experienced an improvement in the pain scale in 2 people, and had a constant pain scale in 7 research subjects.

Table 4
Wilcoxon signed-rank test Result

Group	Frequencies	p-Value
Intervention	11	0.003
Control	11	0.643

Based on Table 4, the results of the Wilcoxon Signed-Ranks Test show a p-value = 0.003 in the intervention group. This means that there is a significant change between the pre-test and post-test scores. In the control group, the Wilcoxon Signed-Ranks Test showed a p-value = 0.643, this shows that in the control group, there was no significant difference between the pre-test value and the post-test value.

DISCUSSION

The Wilcoxon test results showed that there was a significant difference between the pre-test and post-test in the intervention group, while in the control group, there was no significant difference. This means that the pain scale in the foot exercise intervention group provides benefits in reducing the pain scale or also minimizing the risk of worsening neuropathy conditions in research subjects. Foot exercises carried out by research subjects were able to prevent the worsening of neuropathy conditions, which was indicated by the absence of elderly people who experienced worsening of the pain scale. Different conditions were found in the control group, where 2 elderly people experienced a worsening of the pain scale, although 2 elderly people experienced an improvement in the pain scale. The elderly who experienced improvements in the pain scale in the control group after being evaluated carried out massage independently. This may be the reason for the improvement in the pain scale of 2 elderly people in the control group. For the elderly in the intervention group, there were 3 elderly who experienced an improvement on the severe pain scale to a moderate pain scale, and there were no elderly who experienced a worsening of the pain scale.

The results of this study show that foot exercises reduce neuropathic pain in the elderly after doing them for 2 weeks. In the intervention group, there was a change in the pain scale because foot exercises increased vasodilation of blood vessels in the leg area, thereby increasing blood flow to the treated area relaxing the muscles, and reducing the intensity of neuropathic pain (Sumarliyah & Saputro, 2019). Apart from that, foot exercises can provide sensory sensation to the nerves of the feet which will experience a more comfortable response or stimulation in the painful feet, and stimulate painless signals to the brain so that the intensity of neuropathic pain decreases (Basri et al., 2021). This is by the results of research conducted by (Yulita et al., 2019), the mean intensity of neuropathic pain in the study showed a difference between pre-post in the treatment group with a p-value of 0.000 ($p < 0.05$). Meanwhile, in the control group, the p-value was 0.073 ($p > 0.05$), which means there was no difference between pre-post in the control group, because the control group was not given foot exercise, it can be concluded that there was no significant difference. Another study conducted on 17 respondents also showed the same results. The research obtained results that the pain scale in the intervention group before being given treatment was 3.47 while after being given treatment it was 2.53. It can be seen that from the statistical test of pain intensity in the intervention group after being given treatment, the value of $p = 0.005$ was obtained, which means that there was an effect of foot exercises on reducing pain intensity in neuropathic pain sufferers (Fauziah & Kurniati, 2016).

Neuropathic pain occurs due to damage or pressure on the nervous system. The treatment that can be given to reduce pain in neuropathy sufferers is foot exercises. Gymnastics is a movement stimulation process that aims to improve the condition of the body, where specifically the muscles or tissue used have a direct mechanical effect that can stimulate blood

circulation and make muscles more relaxed and flexible by increasing blood flow, minimizing nerve damage, and reducing pain intensity. Foot exercises are one of the activities recommended for sufferers of neuropathic pain. Foot exercises can prevent injury and help blood circulation, especially in the lower extremities (Embuai et al., 2019). The movement method used in foot exercise is to move the legs by stretching and contracting the leg muscles as well as movement in the joints to stimulate increased blood flow to the foot and legs (Wijayanti et al., 2018).

Foot exercises can make the body more relaxed, and the production of endorphins in the body increases, this hormone functions to block substance P which acts as a pain trigger so that the transmission of pain impulses in the spinal cord can be inhibited and the intensity of neuropathic pain in the lower extremities can decrease. Apart from that, Guyton & Hall (2008) argue that foot exercises provide movement in the legs. This leads to the elongation of leg muscles and the compression of veins surrounding them, promoting blood flow towards the heart and reducing venous pressure, a process referred to as the "venous pump." This phenomenon aids in enhancing blood circulation in the legs, strengthening small muscles, preventing deformities, boosting calf and thigh muscle strength, and addressing joint limitations. Enhanced blood flow inhibits demyelination, thus preserving the myelin sheath around neurons, crucial for efficient impulse transmission to sensory, motor, and autonomic receptor cells (Rosyid & Hutama, 2023). Additionally, foot exercises induce vasodilation in blood vessels, facilitating the delivery of nutrients and oxygen essential for cellular metabolism. Without adequate nutrient and oxygen supply, cells resort to anaerobic metabolism, producing lactic acid that stimulates pain receptors (Sartika et al., 2023). Consequently, the researcher posits that the reduction in neuropathic pain observed in the study subjects can be attributed to the regular implementation of foot exercise treatment over two weeks.

CONCLUSION

Foot exercise can relieve the neuropathic pain scale in elder people after being carried out for 2 weeks. This shows that foot exercises can reduce neuropathic pain in the elderly if done continuously for 2 weeks.

BIBLIOGRAPHY

Abdurrasyid, Seipattiratu, C., Pasireron, A. V., Kempa, M. F., Chan, P. J., Laisoka, H. R., Haryandasari, D., Husniyah, D., & Hardiyanti, W. (2020). Pemberdayaan Masyarakat Dalam Mencegah Terjadinya Neuropati Perifer Melalui Senam Kaki pada Lansia Tahun 2020. *Jurnal Abdimas*, *7*(1), 37–43.

Basri, M., K., B., & Rahmatia, S. (2021). Pengaruh Senam Kaki Terhadap Nilai Respon Neuropati Pada Penderita Diabetes Melitus Tipe 2 Di Puskesmas Tamalanrea Makasar. *Muhammad Basri[1], Baharuddin.K[2], Sitti Rahmatia*, *16*(1), 40–46.

Budi, S., Syahfitri, R. D., & Dinata, D. P. (2021). Analisis Program Pelatihan Senam Kaki Pada Penderita Diabetes Melitus Tipe II Dalam Upaya Penurunan Neuropati. *Seminar Nasional Paedagoria*, 62–67.

Devi, F. L. (2021). Manajemen Nyeri Neuropatik. *Jurnal Penelitian Perawat Profesional*, *3*(1), 179–188. https://doi.org/https://doi.org/10.37287/jppp.v3i1.370

Dinarqi, A. A. (2021). *GAMBARAN PENGETAHUAN NEUROPATI PADA PENDERITA DIABETES MELLITUS DI KABUPATEN KENDAL* [Universitas Muhammadiyah Surakarta]. https://eprints.ums.ac.id/91652/11/NASKAH PUBLIKASI.pdf

Embuai, S., Siauta, M., & Tuasikal, H. (2019). Effect of Foot Exercise and Care on Peripheral

Vascular Status in Patients with Diabetes Mellitus. *Jurnal Ners*, *14*(3), 5–12. https://doi.org/https://doi.org/10.20473/jn.v14i3.16943

Emril, D. R., Basar, A. A., Desiana, & Kurniawan, H. (2018). Pola Penatalaksanaan Nyeri Neuropatik Di Pusat Pelayanan Kesehatan Primer Di Kota Banda Aceh. *Jurnal Sinaps*, *1*(3), 78–91. https://jurnalsinaps.com/index.php/sinaps/article/view/47/30

Fauziah, R., & Kurniati, T. (2016). *Pengaruh Senam Diabetik Dan Senam Kaki Terhadap Penurunan Kadar Gula Darah Dan Intensitas Nyeri Pada DM Tipe 2 Di Rumah Sakit Islam Jakarta Cempaka Putih Tahun 2016* [Universitas Muhammadiyah Jakarta]. https://perpus.fikumj.ac.id/index.php?p=fstream-pdf&fid=5904&bid=3592

Purwata, T. E., Widyadharma, I. P. E., & Wijayanti, I. A. S. (2016). Management Of Neuropathic Pain: Focus On Pregabalin. *Neurology in Elderly*, 103–114. https://erepo.unud.ac.id/id/eprint/8884/1/c68b50cdf82f0374a666936286f047b6.pdf

Rantung, J. (2019). Penerapan Terapi Musik Terhadap Nyeri Neuropati Pada Penyandang Diabetes Mellitus. *Nutrix Journal*, *3*(1), 21–28. https://doi.org/https://doi.org/10.37771/nj.Vol3.Iss1.392

Rosyid, L. S., & Hutama, F. H. (2023). The Effect Of Foot Exercise On The Status Of Lower Extremity Sensory Neuropathy In Patients With Type 2 Diabetes Mellitus At The Tanjunganom Health Center, Nganjuk Regency. *Indonesian Journal of Community Health Nursing*, *8*(2), 78–83. https://doi.org/Doi:10.20473/ijchn.v8i2.46791

Sartika, M., Suryana, I., Azam, R., & Jumaiyah, W. (2023). The Implementation of Hands and Feet Exercise Towards Pain Management Among DM Type II Patients with Peripheral Neuropathy in Indonesia. *Jurnal Keperawatan Komprehensif*, *9*(3), 284–288. https://doi.org/https://doi.org/10.33755/jkk

Simamora, F. A., Siregar, H. R., & Hidayah, A. (2020). Pengaruh Senam Kaki Diabetik Terhadap Penurunan Neuropati Pada Penderita Diabetes Melitus Tipe 2. *Jurnal Education And Development*, *8*(4), 431. https://doi.org/https://doi.org/10.37081/ed.v8i4.2164

Suhertini, C., & Subandi. (2016). Senam Kaki Efektif Mengobati Neuropati Diabetik Pada Penderita Diabetes Mellitus. *Jurnal Kesehatan*, *VII*(3), 480–487.

Sumarliyah, E., & Saputro, S. H. (2019). Efektifitas Pelaksanaan Senam Kaki Diabetic dalam Menurunkan Intensitas Nyeri pada Pasien Diabetus Mellitus di Rumah Sakit Siti Khodijah Sepanjang. *Jurnal Keperawatan Muhammadiyah*, *3*(2), 122–127. https://doi.org/https://doi.org/10.30651/jkm.v3i2.2598

Wijayanti, D., Sujianto, U., & Juniarto, A. Z. (2018). *Modul Senam Kaki Pelatihan Educator*. Universitas Diponegoro. https://doc-pak.undip.ac.id/id/eprint/2252/2/MODUL PELATIHAN EDUKATOR TTG DM.pdf

Yulita, R. F., Waluyo, A., & Azzam, R. (2019). Pengaruh Senam Kaki terhadap Penurunan Skor Neuropati dan Kadar Gula Darah pada Pasien DM Tipe 2 di Persadia RS. TK. II. Dustira Cimahi. Journal of Telenursing (JOTING). *Journal of Telenursing (JOTING)*, *1*(1), 80–95. https://doi.org/https://doi.org/10.31539/joting.v1i1.498